THE

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ELECTRICAL REVIEW.

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RECONNOITRING.

GRADUALLY the views held by many men respecting the duration of the war have been undergoing a change. In the early days there were many to speculate and generally optimism was allowed to influence their calculations. The daily course of events has, however, brought us face to face with actual facts which we could not know before because the experience was entirely new to us all, and this course of events, with its stern realities, has led to the revision of estimates in many directions. Those who made merry at the alteration in the German time-table and expected appropriately to celebrate the coming of Peace at Christmas-tide care not now to venture an opinion, preferring to study the latest chapter in the story of failures and successes of the forces. Of course this changed demeanour is not in the least indicative of a lessening conviction as to the ultimate result of the combined efforts of the Allies to stamp out the Curse of Prussian militarism and to avenge the shameless and cowardly crushing of the most gallant little State of modern history by the overgrown bully who was spiteful because there came a flat refusal instead of an abject compliance with his domineering demands. The determination to win, and the conviction that we shall achieve this end for which we have set out, are as strong as, indeed stronger than, ever. But the utterance of over-optimistic views has given place to interested and serious study of such matters as strategy, the preparation of new forces, and to a strengthening of known or discovered weak places. We know now that the end is not yet, and believe that patience, endurance, sacrifice in blood and money, sacrifice national and personal, will be required of us if we are going to carry this struggle right home to such a conclusion as shall prevent a recurrence a few years later.

It has been impossible for men who have watched the splendid engineering progress of Belgium during the past decade or two to refrain from expletives of no superficial kind—expletives expressive of the deep emotions representing intermingling of anger and sympathy at the calamitous havoc wrought by the invader. The works of Cockerill and Carels Frères, the steel works achievements and the gas and oil engine building operations, the name of Greiner—these are but reminders of the Belgian industries which have for years marked out these progressive Allies of ours, industries which have now been laid low. There will not be an engineer in either hemisphere, unless he be a German, who will not have an emotion of sympathy for Adolphe Greiner and those of whom he is a type in this period of unparalleled catastrophe. May time decree that a grander, greater, still more progressive Belgium shall arise from the present ashes—ashes saturated with the blood of heroic sons who beat back the tyrant foe while protecting the home threshold, whose daughters were maltreated, and helpless babes even bayonetted, as coming generations shall be taught to know, to make a holiday for the friends of German Militarism *cum* Kultur; that there will be a penalty to pay for the events of 1914 we have no shadow of doubt.

It sounds almost blasphemous to turn from such crimes to so sublime a truth as this: "There is a Divinity which shapes our ends rough hew them as we may." Nemesis shall shape the end in this case, whether it use therefor the forces of the Allies or some other instrument. Already Germany is degraded in the eyes of the world and of the ages that follow; already Belgium is given a permanent place of honour in the history of small nations, and sparkles as a gem of the first water in the crown of European heroism—but at what a cost! Poor Belgium! The annals of the nations are enriched by your example, by the stout resistance you have dared to offer to superior forces. You had so little to gain by refusal! And compliance would have been so easy!

But we have digressed—we did not set out with the intention to pay our homage—the fall of Antwerp must be our excuse, if any need for apology exist. Let us return without further ado to the consideration of the new attitude that necessarily affects so many of our thoughts as we resign ourselves to a protracted campaign. Take the one subject of the effect of the long war idea upon industrial and trade affairs. When we awoke one day to find that our fleet had practically shut Germany off from the markets of the world, the first idea suggested was concerned with the necessity for taking immediate action to profit from such an unthought of state of affairs. In the early ideas of a war of short duration, the phrase "Capture Germany's Trade" was produced, suggesting that if we did not go in pursuit immediately, without waiting for scheme, or plan or thought, the British Navy would have come home again, and German exporting would have resumed its normal course before we could do anything. We have written much ourselves, and, alas! have read more, much more, on this subject during these two or three months, and what do we think now? What does the British electrical manufacturer think? Have we, has he, caught this elusive creature that we call German electrical trade? Nay, may we go further and ask, has he done anything to track the wily courses of this Elusive Pimpernel? He has most assuredly grumbled about its practices long enough—does he now hold that it is not worth trying to secure?—or, peradventure, it may perform the interesting feat of capturing itself—who knows? Some appear to fancy that will be the upshot of this present little affair in which Europe is engaged.

Now, to our mind the answer to these and other questions of the same kind is to be found in the fact that passing months have taught us all to think longer and deeper thoughts about this matter of the war on German trade, and as we have become convinced that German trade is not going to be won by two or three tricks of the prestidigitateur any more than German militarism is going to be crushed out by a battle here and a battle there, so we have got down to the solid fact that German electrical trade has got to be won not by childs' play practices or by glib or sanguinary chatter, or in an exciting lassoing chase, but by the laying out of very definite plans, by the organisation of very strong forces suited to the contest, and by the adoption of far-seeing measures which shall not merely ensure a few orders here and there now, but shall retain trade connections of value, and prevent a recurrence as far as possible of unscrupulous domination of our markets long after the sword has been sheathed again. Perhaps it is because there has been too much flippancy or superficial or vindictive reference to this matter that so little appears to have been done in the electrical world. Perhaps it is that the time is not ripe for far-reaching action. Perhaps everybody is waiting for somebody else. Perhaps there is somewhere a solemn opinion that this thing is going to work itself out all right in the end. We believe that all of these reasons are factors in the situation, but there are others as well. Factories and office organisations are deprived of men who are away with the Forces. Money never easily raised for industrials of our class, can be raised less easily still at such a time. The Home market is free, and the absence of German competition therein, save as far as stocks affect the position, may be furnishing new business; also we are having replaced here contracts which Germany once had, but cannot now execute; so that our hands *may* be full—we do not say that they are. During the war the business in the United Kingdom, and from some Continental countries too, if we can handle it, may come without any "capturing." As regards the outer markets where Germany has been so powerful, though our German competitors are now absent, the demand also is affected by the same circumstances as have stopped the competition. Not a country in the world has been free from financial anxiety since this war broke out, and some of the big markets abroad that we really ought to have set about capturing electrically years ago, are of little immediate use save for what we may describe as absolute essentials. The more our cousins of the United States get seriously down to their own relation to the altered trading position due to the absence of Germany, the more do they find themselves up against the consequences of the state of financial chaos into which all the world was flung in the late July and early August days of this year.

One American authority at least is advising his readers to devote attention to the possibilities that lie awaiting attention "right here" in these United States, rather than go away on a wild-goose foreign chase. That attitude, if it continues, may suit us very well. We cannot feel that it represents the definite majority policy of American traders, but it suggests that the difficulties are dictating a wait-and-see policy so far as some of them are concerned.

Without further prolonging this article to go into some of the other factors in the situation which go to make the British electrical trade seeker hesitate in regard to the course of action best fitted to the circumstances, we think that we have said sufficient to suggest that while we are bound to benefit from the present position while it lasts, the "capturing" of outer markets and their permanent holding at a later date will require measures which will call forth all the ingenuity, skill and resource, foresight and organising ability, tact and diplomacy, of which the British electrical and allied manufacturers are possessed, and possibly some assistance from higher quarters too. We do not withdraw one word of our previously expressed view concerning the effect of the present world-wide revulsion against all things German. It will last for years; but it may not always last. That price and some other things may tell five years after the war ends or, perhaps, earlier, there is little present reason for doubting. But with the growing conviction that hostilities must long continue, and that the longer they continue the worse it will be for German industries, while there is some justification for the absence of panic-aggressive action on the part of our firms, we should like to hear of more long-thinking, whether individually or collectively, with the object of securing that British electrical industry shall be substantially and permanently advantaged by the opportunity that now offers itself. It is true, as we have said, that there are markets that cannot yield great immediate results while the financial stress and strain continue to stop new commitments on a large scale, and to render some buyers, even of bread and butter lines, insecure, but if we do not make an attempt worthy of a great British industry, then it will be to our everlasting reproach, and probably it will lead to our finding ourselves more easily beaten by the new Teutonic competition if, and when, it comes.

We are not suggesting that British electrical manufacturers are asleep, or that they have done nothing. Our postbag and our conversation with men have told us differently. Here and there individual firms are considering their own personal relation to the position: how they can in their works make this or that new line, or what prospects their particular make of article would have in a new market and how to get it known there. But there is a danger of their losing heart, because of the inevitable weakness of individual policy and isolated action. They could so much more readily and more hopefully consider the difficulties and the prospects and the financial and technical problems involved if they could only put their heads together. There is a desire on the part of some to act in co-operation, or, at any rate, to study matters in a preliminary way in conference, and we trust that as the weeks pass by this disposition may grow and something useful may be done. We should like to recommend that a public meeting of the electrical industry be summoned at which the position shall be laid before us all by an authority, and discussed seriously and in detail, and without feelings of undue reserve and suspicion.

Cable Censorship.

In another column we publish the text of a protest lodged by the Commercial Cable Co. with the U.S. Government on August 14th last, as well as their circular of August 20th, sent to "Our Patrons" with a copy of the protest, both of which have just reached our hands. We are rather surprised at the attitude adopted by a company gaining a large share of its revenue in Great Britain, where every freedom and facility for trading is given, and one is forced to the conclusion that steps are being taken with a view to upsetting regulations and restrictions which, in the opinion of our Government, are necessary to the safety and well-being of this country. In view of the sympathy with our cause so freely expressed by the American public, we cannot bring ourselves to believe that they are not prepared to assist us by abiding by these regulations. The wording of the protest and the circular is neither well chosen nor in good taste, and, in fact, the passage : "We do not believe our patrons wish their cablegrams to be subjected to the espionage of Government officials, not even on rare occasions" is, we consider, highly offensive and improper. As a neutral country the United States is bound to censor messages and abide by the prohibitions issued here.

We are aware that traffic has suffered a considerable reduction, and that by reason of the cutting of the German cables in the English Channel, the Commercial Co. has probably suffered severely, as it works the ends of the cables at New York, but in view of the company being also registered in Great Britain, we consider that an attempt to bring about conditions inimical to our interests as a nation cannot be too severely reprehended. It is the privilege of an Englishman to grumble, but he has shown by the unstinted support he has given to his King and country that his patriotism is deep-seated, and he will bear with equanimity whatever inconvenience is imposed on him by reason of his obligations to the Government, and will not increase its burden by upholding agitations tending to prejudice measures taken for the safety of the Empire.

Rubber.

All things considered, the rubber market has kept up a firm front during the last few weeks, and there has been a steady and sustained demand met with from Russia, while there is much irregularity about the way in which arrivals are coming forward from the Near East. The general home buying is naturally of a more restrained character, for the war is beginning to make itself felt, but there are reasons for thinking that there will be a pretty steady consumption nevertheless. There is, however, hardly any reasonable likelihood of prices being advanced much because, so far as is to be gathered from the latest returns from the plantations, the production remains big. The activities of German warships in Eastern waters, while temporarily checking arrivals here, cannot have any bearing upon the output of the plantations, and at the most can only cause shipments to be delayed for a time. Hence the probabilities favour a rather easy market when temporary conditions at present ruling, such as the Russian demand and the holding up of quantities afloat, disappear. Fine hard Para continues to command a big premium over plantation grades.

Amongst the industries which it is hoped ultimately to extend largely in this country as one of the results of the war is that of rubber. There is, of course, a very large amount of capital already invested in it, but it is certain that there is ample room for extensions at the expense of Germany, and it is here that efforts are to be made. The tire trade alone represents an important branch in which Great Britain might cut a very much more important figure than is the case to-day, and this to the advantage of British interests at home and abroad. Rubber flooring is another department to which it is probable that particular attention may be given, and the efforts of the Rubber Growers' Association to introduce this material are likely to receive considerable support, for they have made a number of presentations of rubber flooring material to hospitals, and the successful adoption of rubber in this connection is bound to extend. The trade was practically a British one, but Germany has lately been cutting into it. Only a few days ago the flooring given to Guy's Hospital was officially presented, covering an area of 750 sq. yards, and weighing 30,000 lb., while about 200 sq. yards are shortly to be presented to the Children's Hospital in Great Ormond Street.

The declaration of rubber as conditional contraband came as a surprise, but it was necessary to prevent the enemy being in a position to secure supplies of material which would be of the greatest use to him in the manufacture of motor tires, waterproof ground sheets for troops, hot-water bottles for the Red Cross, and so forth. There is no doubt that the Germans have been making strenuous efforts to secure supplies of rubber, but the action of our authorities will put a spoke in their wheel, though to some extent no doubt Holland and Denmark can be looked upon as sources of supply.

According to information received by the Malay States Information Agency from the Government of the Federated Malay States, the exports of plantation rubber from the Federated Malay States for July amounted to 2,971 tons, compared with 1,781 tons in the corresponding month last year and 2,306 tons in June last.

Appended are the comparative statistics for 1912 and 1913 :—

	1912.	1913.	1914.
January	1,218	2,131	2,512 tons.
February	1,212	1,757	2,364 ,,
March	1,379	1,737	2,418 ,,
April	1,020	1,626	2,151 ,,
May...	1,007	1,225	2,069 ,,
June	1,029	2,005	2,306 ,,
July	1,204	1,781	2,971 ,,
Total	8,069	12,262	16,821 ,,

LARGE INDUCTION MOTORS: SOME FEATURES OF MECHANICAL DESIGN.

By G. MOORES, B.Sc. Eng.

(*Continued from page* 508.)

Rotors.

Whilst in the case of stator cores strength is perhaps of secondary importance, in the case of rotors it is a matter for primary consideration on account of the stresses caused by centrifugal force. The various parts of a rotor which have to be considered separately from the point of view of strength are the spider, the shaft, the endplates, the core punchings, and the winding.

Spiders.—These are generally made of cast-iron, unless their peripheral speed exceeds the safe limit for this material —about 100 ft. per sec.—when cast-steel should be used. If the speed approaches the limiting speed for cast-iron, the question of the stresses due to the centrifugal force in the punchings should be considered, and generally the punchings should, in this case, be made self-supporting, so that the only stress in the spider is that caused by centrifugal force due to its own weight. It is important in designing spiders of large diameter to make sure that there can be no undue initial strains set up in the cooling of the casting. This is taken care of in several ways. Sometimes the hub is split longitudinally in two or three places equally spaced apart, and the segments are either bolted together or keyed separately on to the shaft, in which latter case the splits may be filled in with some soft metal such as lead. When this method is adopted it is important to do the keying in such a manner that each segment of the hub takes its proper share of the load. Another method used is to split the rim of the spider and tie the segments together afterwards by means of steel links bolted on. A third type, usually adopted in the case of heavy spiders which are intended to act also as fly-wheels, is the "built-up" spider, consisting of two or more sections

bolted together. Still another method consists in making the spider without a rim and with heavy arms widened out at the ends to form a seat for the core punchings, as shown in fig. 21.

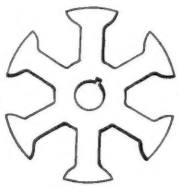


Fig. 21.

The arms of spiders are sometimes made of an oval or similar section—which gives a neat appearance to the finished rotor—but more often they are of T, or H, or similar sections, and webbed together, as in fig. 22, which illustrates the rotor of a 350 B.H.P., 180-R.P.M. motor by

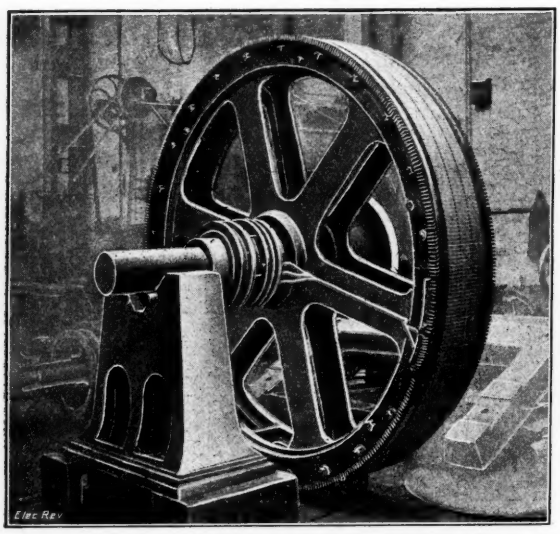


Fig. 22.—Rotor of Vickers 350-H.P. Motor.

Messrs. Vickers, Ltd. Fig. 23 shows the spider—cast in two sections — of a 605-B H P. 53-R.P.M. motor by Messrs. Siemens Bros.

End-Plates.—The primary function of end-plates is, of course, to hold the core punchings together under pressure, but provision is frequently made in them for other purposes

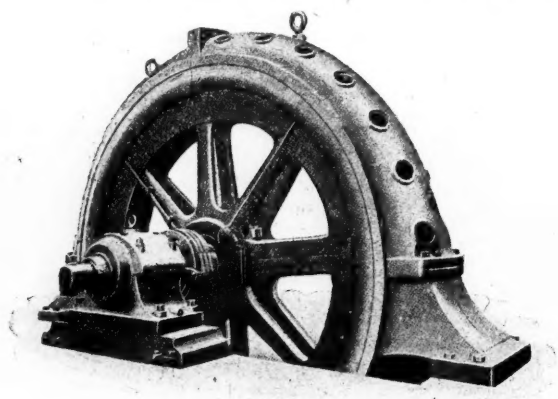


Fig. 23.—Siemens 605-H.P. Motor.

such as supporting the rotor winding, balancing the rotor, or carrying fans. Fig. 24 shows a typical cast-iron end-plate and coil support cast in one piece with recess for balancing purposes, and with fan blades bolted on.

For low or moderate peripheral speeds end-plates are usually made either of cast-iron or forged from wrought iron bar if their shape is suitable. For high speeds they should be made of cast-steel and designed of ample proportions in view of the difficulty of obtaining steel castings of this nature free from flaws.

Windings.—It is necessary to secure the windings of high-speed rotors mechanically to ensure against (1) change of shape of the end connections, and consequent disturbing of the balance of the rotor; (2) lifting of the coils due to centrifugal force.

The possibility of change of shape of the end connections, or of damage to the insulation due to vibration, may be

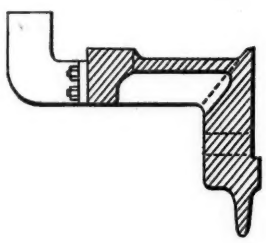


Fig. 24.

Fig. 25.

prevented, as a rule, by the provision of suitable coil supports. It has been the practice of many firms in the past to build machines without coil supports, especially machines with a large number of poles, as these are usually of comparative slow speed, and have short end connections, But experience has proved that it is better to be on the side of safety, and the practice is growing more common of providing all large motors with some form of coil support.

The prevention of lifting of the coils, due to centrifugal force, is usually accomplished by banding the winding with hard steel wire or similar material. Fig. 25 shows a method of securing a winding of the hand-wound "concentric" type by tieing down the coils to a support by small bands of phosphor-bronze strip, and fig. 26 a winding of the "barrel" type secured by a band of steel wire. The stresses in such bands should be ascertained, and an

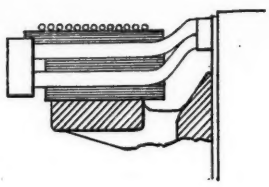


Fig. 26.

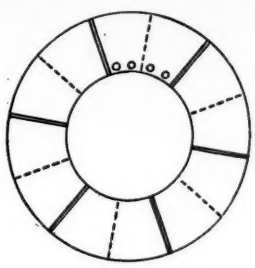


Fig. 27.

ample margin of safety allowed. These stresses may be calculated from the formula: Stress in band (lb. per sq. in.) $= W R N^2/18{,}400 A$, in which W = weight of end connections under band in lb., R = mean radius of end connections in feet, N = R.P.M., A = area of section of band in square inches, W may be taken as half the difference between the weight of copper in slots and the weight of the whole winding. The formula is derived as follows:—

Centrifugal force on end connections $= W v^2/g R$ lb. where v is in ft. per sec.

Bursting force on band $= W v^2/2 \pi g R$ lb.

Stress in band $= W v^2/2 \pi g R A$ lb. per sq. in.

$$= \frac{W}{2 \pi g R A} \times \left(\frac{2 \pi R N}{60}\right)^2 = \frac{W R N^2}{18{,}400 A}.$$

This formula neglects the stress due to the weight of the band itself. In the case of high peripheral speeds it becomes necessary to include this self-stress, for which a convenient expression is obtained as follows:—

Stress in band due to its own weight $= W R N^2/18{,}400 A$ as above, and

$W = 2 \pi R . 12 . A w$ where w is the weight in lb. per cb. in. of the material composing the band. Therefore stress

$$= \frac{2 \pi R . 12 . A w R N^2}{18{,}400 A} = \frac{w R^2 N^2}{245} \text{ lb. per sq. in.}$$

If the band is of steel this expression becomes $R^2 N^2/940$ lb. per sq. in., where R is the radius in feet of the band and N the R.P.M.

This stress, of course, must be added to that obtained by the previous formula to obtain the actual total stress in the band. As hard steel banding wire may be obtained with an ultimate strength of 200,000 to 300,000 lb. per sq. in., a total working stress of 20,000 to 30,000 lb. per sq. in. may in this quality be safely allowed.

Rotor Cores.—The methods of constructing rotor cores are very similar to those used in the case of stator cores. There are the same two classes—keyed and bolted. In the case of rotors fixed with key rings the punchings are usually secured to the spider against centrifugal force by means of dovetails. When this is done, however, and when the punchings are in segments instead of complete circles, all the stress due to centrifugal force on the core punchings comes on the spider as well as that due to the weight of the spider itself, and in the case of high-speed rotors this becomes objectionable. One method of obviating it is to pin the punching segments together so that they shall form complete circles, and be self-supporting against centrifugal force. It is advisable in this case to determine the stresses which are set up in the core, as these may easily be excessive. The following is an example of the method of doing this from a particular machine recently built. The case is one of a 2,000-H.P. motor with a normal speed of 500 R.P.M., but the stresses are calculated for an overspeed of 625 R.P.M.

The rotor diameter was 59 in., and its length 21½ in. net. Each circle of the rotor punchings was divided into six segments, and the segments were interleaved in the building of the core, that is, each layer of punchings had its joints midway between those of the adjacent layer. The core was bound together by means of steel pins, four of which passed through each segment, as shown in fig. 27.

The total weight of iron was 6,295 lb., mean radius 2·11 ft., mean peripheral speed 141 ft. per sec. The total weight of the winding was 464 lb., mean radius 2·39 ft., mean peripheral speed 160 ft. per sec. The stresses set up in the core are calculated as follows :—

$$\text{Centrifugal force of iron } \frac{6{,}295 \times 141^2}{32{\cdot}2 \times 2{\cdot}11} = 1{,}830{,}000 \text{ lb.}$$

$$\text{Do. copper } \frac{464 \times 160^2}{32{\cdot}2 \times 2{\cdot}39} = 154{,}000 \text{ lb.}$$

Total centrifugal force 1,984,000 lb.

Total bursting force $1{,}984{,}000/2\pi = 314{,}000$ lb.

Depth of iron below teeth 6·45 in.

Bursting stress at joint in core = P/area

$$= \frac{314{,}000}{10{\cdot}25 \times 6{\cdot}45} = 4{,}750 \text{ lb. per sq. in. } (a)$$

Bearing pressure on bolts 1 in. diameter

$$\frac{314{,}000}{2 \times (\cdot 5 \times 20{\cdot}5) \times 1} = 15{,}300 \text{ lb. per sq. in.}$$

$$\text{Bursting force per segment} = \frac{314{,}000}{10\frac{1}{4} \times 56} = 548 \text{ lb.}$$

Radial distance from bolts to mean diameter of core = 3·17 in.

Bending moment on segment due to eccentricity of bolts = 548 × 3·17 = 1,740 in. lb.

Modulus of section $b\,h^2/6 = z$.

$$\text{Stress due to bending } 1{,}740/z = \frac{1{,}740 \times 56 \times 6}{6{\cdot}45 \times 6{\cdot}45}$$

$$= 14{,}000 \text{ lb. per sq. in. } (b).$$

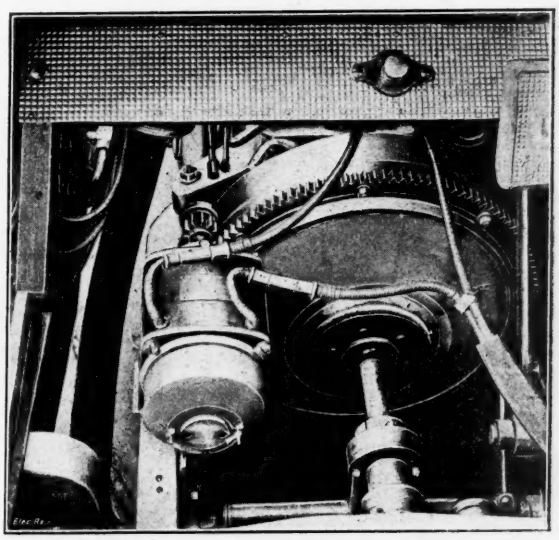
Total max. stress on punchings = $(a) + (b)$ = *18,750* lb. per sq. in.

This figure is slightly in excess of the actual stress, as there is also a second bending stress—opposite in direction to the first—which is due to the centrifugal force on the segment, but this is so small as to be practically negligible.

(*To be continued.*)

THE BROLT ELECTRIC ENGINE STARTER FOR MOTOR-CARS.

When describing, about a year ago, the various electric engine starting arrangements which have been introduced for use on petrol motor cars to render the old starting handle a thing of the past, we pointed out that the majority of such devices were designed to act through the engine flywheel, the latter being rotated either by a friction pulley or through toothed gearing. While gearing gives a more positive drive, the question of bringing the driving pinion into and out of mesh with the toothed ring formed on the periphery of the flywheel has formed a problem on which much thought has had to be centred, and one which has resulted in the introduction of a number of different methods, some more or less complicated. On the same occasion, we mentioned that one of the simplest and most effective, in so far that the engagement and disengagement of the pinion were effected entirely automatically, was that adopted on the electric engine starter made by Messrs. Brolt, Ltd., of Birmingham, for



Brolt Starter on Talbot Car.

whom Messrs. Brown Bros., Ltd., London, are the sole selling agents.

Although the principle—that of the pinion automatically winding itself into mesh when the current is switched on to the motor, and throwing itself out of gear when the engine is started—is still the same, the method of its application has, as a result of protracted experiments and experience, been somewhat modified, so that the appended particulars of the latest model may not be without interest.

At first, the extended end of the armature spindle had cut on it a spiral thread; the driving pinion, which was loose on the spindle, had a similar, internally-cut thread, the arrangement being somewhat akin to the familiar small Archimedean-screw hand drill. In its latest form, the driving end of the armature spindle is enlarged and made hollow, the interior being cut with a quick-pitch screw-thread. The pinion which drives the flywheel is cut from a solid piece of steel with an extension, which enters into and slides in the hole in the armature spindle. Two helical keys are cut on this extension and really act as part of a screw-thread, that engages with the internal thread of the armature spindle. The armature, being series-wound, accelerates rapidly when the current from the battery is switched on by pressing down a pedal, thereby inducing a spiral tendency in the pinion, which, because of its inertia,

tends to lag relatively to the acceleration rate of the armature. As the spindle only drives the pinion through the medium of the screw-thread, the pinion is instantly drawn—towards the electric motor—into engagement with the flywheel teeth, travelling axially along until it is against the end of the armature spindle, when the whole rotates solidly together and drives the flywheel. A spring is provided to prevent any shock when the pinion reaches the end of its travel, which latter is so arranged that when the pinion is screwed home against the end of the spindle it is fully in mesh with the teeth on the engine flywheel. At the other end of its travel it is out of engagement and clear of the flywheel teeth.

As soon as the engine takes up the running, the flywheel commences to over-run the pinion, which causes it automatically to unscrew itself out of engagement, in which position it remains until again required to turn the flywheel. It will readily be seen that there is thus no risk of damaging the teeth of the gears on engaging, as no driving power is exerted until the pinion is fully into mesh, it simply floating on the screw-thread until the end of the travel has been reached.

When the Brolt starter was first introduced, some fear was expressed that the vibration resulting from a car travelling over bumpy roads might cause the driving pinion to have a slight movement along the armature spindle and so bring the teeth into contact with those on the periphery of the flywheel, to the detriment of both. In order to avoid any risk of this kind, and also to prevent any damage, even if the starter be operated while the engine is running, a small friction disk is now attached to the outer side of the driving pinion, and the flywheel is turned with two peripheries, one being of a slightly larger diameter than the other. The friction disk—which is out of contact when the engine is running—comes into action about 3 mm. before the teeth engage, so that should the starting pedal be operated with the engine running the pinion is returned to its out-of-engagement position before the teeth can come into mesh. The starter is operated by a pedal switch, which simply consists of a circuit controller, the bringing in and out of mesh of the driving pinion being, as already described, independent and entirely automatic.

The starter, which is a specially-constructed series-wound motor, is adapted to be operated in conjunction with a 44-amp.-hour battery; it is made in three sizes, *viz.*, No. 1, six volts, suitable for small engines up to 2,000 cubic centimetres capacity; weight 20 lb.; No. 2, twelve volts, for average power cars, weight, 26 lb.; and No. 3, twelve volts, for high-compression engines, or those having a greater capacity than 3,500 cubic centimetres, weight 32 lb. It is stated that the No. 2 machine, which has a 12 to 1 gear ratio, will turn an engine of 3,200 cubic centimetres cylinder capacity, at a speed of 140 revs. per min. at a current rate of 50 amps. at 12 volts, and that the torque efficiency is well over 70 per cent. It is further claimed that, if the engine is well tuned, *i.e.*, if the carburation and ignition are correct, the starter will set the engine running in not more than three-quarters of a second, the discharge of current from the battery being thus reduced to a very low figure.

The Argentine Republic.—The imports of electrical goods into the Argentine Republic during the six months ending with June last, according to some official figures just to hand, attained a value of only £960,000, as compared with £972,000 in the corresponding half of 1913.

Fire.—An outbreak of fire occurred on October 8th at the premises of Messrs. Halliwell & Co., electricians, of 43, Thomas Street, Manchester, and caused some damage on the ground floor.

TRADING IN ITALY.

Trade and Retail Supply.

By O. E. ALLO.

As manager of the Italian branch of a prominent British firm, manufacturers of electrical machinery, fittings, electric light accessories, bells, telephones, etc., I should like to give a few hints which I trust will be found useful to intending "pioneers" in that country.

In this branch of the business it is useless "starting in a small way." The trade generally looks with suspicion on the foreign firm with a "small back office," and before trading on extensive lines the contractors want to assure themselves that the newly started business is one that intends to establish itself permanently. They insist on seeing and trying the goods offered, and therefore it is absolutely necessary to have a well-appointed show-room, preferably on some main thoroughfare, and to keep a good stock; in other words, repeating myself from a previous article, "One should start in a way commensurate to the home standing and appear to be what one intends to be taken for."

In Italy suppliers to the trade also carry on retail business, and do their own wiring, installing of motors, plant, etc.

Trade Supply.

This is where the past German competition was felt most acutely, and very keen it has been. Amongst other items I can mention that of lampholders, which can be bought at 2s. a dozen (in dozen lots), and switches at 3s. 6d. per dozen; naturally these goods cannot be compared to our English equivalents, and although they are acknowledged to be "rubbish," are used practically exclusively all over the country. There are, however, ways of getting over these difficulties. With regard to lampholders, which I could not sell at less than twice the amount mentioned, noticing that all German fittings were made of $\frac{3}{8}$in. tubing, I ordered all mine of $\frac{1}{2}$in. tubing and fitted them with lampholders included in the price, with the result that I received orders for them for brackets, and spares, etc., as well as reducing nipples. The tumbler switch is difficult to sell, but I find that the electrical contractor is more to blame than the public, and for a firm doing their own wiring there would be no difficulty in selling these, provided they were of a flat pattern. Generally speaking, all switches, plugs, fuses and ceiling roses of a voluminous character are not wanted, the tendency being for flush or semi-flush work.

Bells, cells, annunciator boards at about 5d. to 7d. a number, and cheap telephones with imitation real wood cases, would sell well.

Retail Sales and Wiring.

This is by far the most profitable part of the business, as in Italy there are no standard prices; one charges "according to circumstances" with the usual "bargaining" from the customer, and for a foreign firm with goods not too well known in the Italian market it is the best way of introducing them. I should perhaps mention here that the contractors themselves have great difficulty in getting their workmen to put up or work with new materials.

In Italy the Edison screw lampholder is exclusively used (except on board ship installations), and with it a cheap gallery with a wide-mouthed globe. I adopted a way of fixing our ordinary bayonet holder globe direct on these Edison screw holders, giving a much more pleasing effect and saving the cost of the gallery with which we could not compete. This was very much appreciated.

As for fittings manufactured locally, these are mostly of an ornamental nature, floral or statuary.

I recollect that a firm bought a few of my cast polished brass brackets intending to copy them; the results were very indifferent, and I believe could not be supplied at my price. I heard nothing more about the matter. Generally speaking, Italian made fittings cost more than German ones, and are not much, if any, better in quality as a competitive article.

In making up catalogues and prices a thorough knowledge of the Italian market must be known so that the articles can be priced, not only according to "cost price landed," but according to the local competition as well, so as to have throughout a "profitable average" price.

Customs Charges.

This is a more complicated business, but with the knowledge of how these are made by the authorities a great saving can be effected. Charges are made per weight, various metals and other materials paying fixed charges according to the nature of their component parts, finish, etc. Some of these charges are:—

	Per Quintal (2 cwt.)
Iron fittings, not lacquered or polished ...	7s.
Iron fittings, lacquered or polished	15s.
Polished copper, brass	60s.
Copper, brass, gilt or otherwise plated	100s.
Switches, plugs, fuses	30s.
Aluminium	120s.

In the case of fittings made up of different materials or finishes, such as different metals, partial gilding, aluminium parts, etc., these are charged at the "highest rated material" rate. This is very important, and by sending fittings dismantled, packing similar metals together, one can save a good deal of expense, time and trouble with the authorities, and it would well repay to install an assembling shop, which would also come in handy for the purpose of repairing and overhauling goods which arrive in a "tired condition" after the long and no doubt rough journey, even if packed with "special care."

Delivery.

This is the *bête noire* of the representative abroad, and causes more ill-feeling than anything else, both with customers and with the people at headquarters. Italians as a rule keep very little stock and then order after they have made the sale; therefore it is to the great advantage of a firm to have the reputation of having always a good stock.

In the case of a large business, a large amount of goods can be left in bonded stockrooms, the payment of the Customs charges being made as they are taken out.

Heating Apparatus.

Heating apparatus in large towns sells fairly well on account of the mode of heating the houses. The housing is done on the flats principle, and the rents include the cost of heating, which is done by steam or water pipes turned on by the janitor. The law compels the heating to be started on the 15th November and shut off on the 15th of March, keeping up during this period a maximum heat of about 17 degrees C. The owners keep strictly to their rights regardless of the state of the weather, so that during this period there is always a good demand for heating apparatus; furthermore, the price for lighting in Milan, for instance, being 3d. per KW.-HR. and from 1½d. to 2½d. per KW.-HR. for power, allows the average public to use these. Cooking apparatus, flat irons, kettles, etc., sell fairly well, but the most successful apparatus are those with interchangeable resistances, as nearly all cities and towns have as many as four different voltages.

There is also a fair field for electro-medical apparatus, Crookes tubes for X-rays, etc., these up to the present having been bought chiefly from Germany and America.

THE COOLIDGE HIGH-POWER X-RAY TUBE.

At the recent exhibition of apparatus in connection with the Clinical Congress of Surgeons, Messrs. Harry W. Cox & Co., Ltd., exhibited examples of the Coolidge pure electron discharge X-ray tube, which appears destined, by its power, flexibility and cool running, to supersede all other known types of Rontgen ray tubes. The superiority of the new tube depends on the method by which negative electrons are produced; instead of ionising some of a small amount of residual gas left within the bulb, the latter is exhausted as completely as possible and the discharge current is purely thermionic in character.

In an ordinary X-ray tube (fig. 1) a high tension discharge produces a stream of negative electrons. The velocity of these cathode rays increases with the p.d. applied to the tube and with the degree of exhaustion. High-velocity discharge pro-

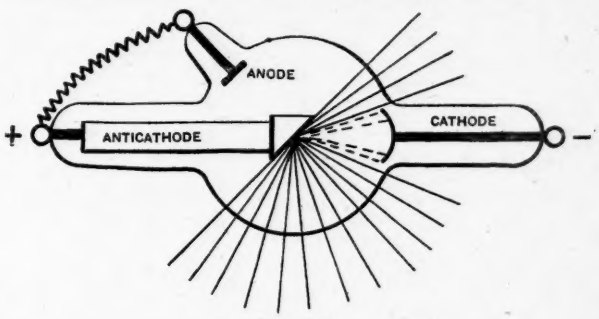


Fig. 1.

duces "hard" Rontgen rays of great penetrative power, while cathode rays of comparatively low velocity produce "soft" rays of diminished penetrative power. In (hitherto) standard focus tubes, the cathode is of aluminium and concave in form, in order that the rays may be focussed on the anticathode which is of copper-, nickel- or silver-backed platinum and sometimes water-cooled. The quantity and quality (hard or soft) of X-rays produced depend simply on the number and violence of negative electron impacts on the anticathode of the tube. Within limits, the quantity of cathode rays depends on the current flowing through the tube while the quality of the rays depends on the applied p.d. The sole source of electrons in an ordinary X-ray tube is, however, the residual air in the bulb and, since only a small, well-defined fraction of this residual gas lends itself to ionisation, it follows that up to this limit, a small variation in applied p.d. varies greatly the number of electrons produced whereas, beyond this limit, a great increase in potential has little effect.

These characteristics render an ordinary X-ray tube inflexible and limit its output. Up to a certain point both output and hardness of rays vary with the applied potential and the vacuum must be regulated so that that potential which gives proper velocity for the hardness desired also gives the right number of electrons for the desired quantity of rays. Most of the heating in an ordinary X-ray tube is due to collisions between electrons and particles of residual gas, and, as the tube warms in service, the potential must be reduced, making the rays softer, or the output must be allowed to increase greatly, making the tube hotter still. At low discharge currents the vacuum gradually improves, making the X-rays harder or more penetrating, and at high discharge currents there are very rapid vacuum changes, sometimes in one direction, sometimes in the other. If a heavy discharge be maintained for more than a few seconds, the target becomes red hot and gives off so much gas that the tube may have to be re-exhausted. Volatilisation of the copper backing of a standard target commences if the latter be allowed to reach bright red heat. Many tubes fail by chipping and cracking of the bulb glass in the zone around the cathode. The focal spot on the target often wanders rapidly or is permanently displaced by a heavy discharge, and no two tubes are exactly alike in their electrical characteristics, which are generally far from ideal in that the penetrating power of the X-rays changes with the magnitude of the discharge current. The breakdown voltage of a standard tube is much higher than the running voltage, so that from periodically intermittent current, even of constant potential, there is produced a very heterogeneous bundle of primary Rontgen rays.

The use of a solid tungsten target, which can be run continuously at white heat, eliminates the trouble due to occluded gases and volatilisation of copper, but the use of a tungsten cathode makes the tube "cranky" unless the cathode be incandesced by working (sustained, in the interim, by gas admissions). This fact and the fact that most limitations of the standard X-ray tube are traceable to the use of gas, led to the use of high vacuum bulbs, "thermionic" production of cathode rays being substituted for production of electrons by bombardment of the cathode with positive ions. The idea of using a hot cathode in a Rontgen tube is not new, but Coolidge claims to be the first to apply the principle success-

fully in a vacuum so good that positive ions do not play an essential part. In Lilienfeld and Rosenthal's tube, for instance, current from a low-voltage source passes from an auxiliary hot cathode to the anode, and thus furnishes the positive ions which, by their bombardment of the main cathode, liberate electrons from it: without the positive ions, there is no means provided to get electrons from the main aluminium cathode. It is possible, however, to eliminate positive ions by sufficiently freeing the bulb and electrodes from gas, and Langmuir has shown that a hot tungsten cathode in a very high vacuum yields electrons continuously at a rate determined by the temperature and unaffected by high voltages up to at least 100,000 volts. For application in the fields of radiography and fluoroscopy, Coolidge has devised a tube with a pure electron discharge, a satisfactory method of focusing and a very heavy target sufficiently freed from gas.

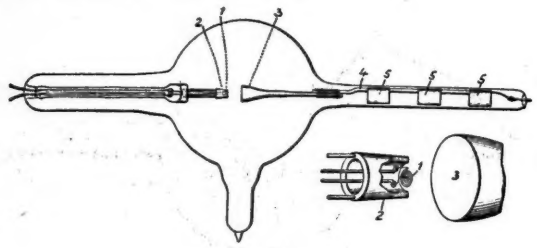


Fig. 2.

Fig. 2 illustrates a focus tube of the new type. Instead of being a few microns, the pressure within the bulb is only a few hundredths of a micron, this low value being attained by a preliminary firing of the tungsten anode and molybdenum support in a tungsten tube vacuum furnace and by substituting a Gaede molecular pump for ordinary mercury pumps. The tube-to-pump connection is large and short and in the later stages of exhausting, a heavy discharge current is maintained for an hour or so, while the bulb is fan-cooled. High vacuum and the elimination of occluded gases are essential.

The cathode consists of a tungsten spiral 1, which can be electrically heated and is mounted within a focusing cylinder 2 of molybdenum, tungsten or other refractory metal. The heated portion of the cathode serves as the source of electrons and the focusing ring or cylinder assists in shaping the electric field round the cathode so that the desired concentration of rays on the target shall result. The target 3, which serves also as anode, consists of a single piece of wrought tungsten (weighing 100 gms. and being 1.9 cm. in diameter at the end facing the cathode). It is bound by molybdenum wire on to a molybdenum rod 4. Molybdenum rings 5, riveted on to the latter, support the anode and prevent too much heat reaching the seal of the leading-in wire. Operation is satisfactory only when the vacuum is so high that 100,000 volts produces no discharge, so long as the cathode is cold.

In the particular tube to which the subjoined data refer, the cathode filament consisted of 5½ turns of 0.216 mm. wire, 33.4 mm. in length, forming a flat spiral 3.5 mm. in diameter. The filament is heated by current from a small battery B, fig. 3,

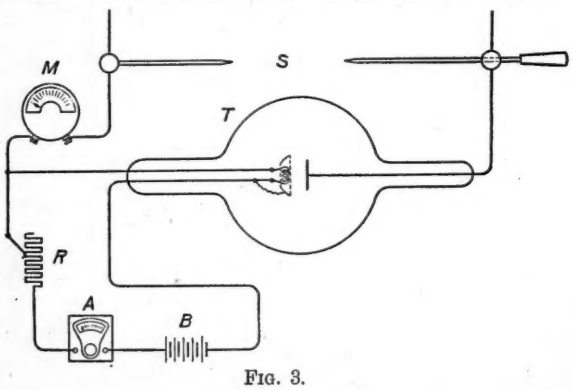


Fig. 3.

which is well insulated from earth, since it is connected to the high-tension circuit. By aid of a variable rheostat R the filament current can be regulated from 3 to 5 amps., corresponding to from 1.8 to 4.6 v. drop in the filament and filament temperatures from 1617° to 2267° C. The adjustable spark gap S is connected across the bulb terminals in series with a milliammeter M. Both S and R can be adjusted and M can be read from behind the lead screen shielding the operator. Owing to the possibility of maintaining much greater Rontgen ray intensities than heretofore, it does not follow that precautions, shown to be sufficient for work with the old tube, will be adequate for the new one.

The Coolidge tube suppresses any current in the direction which does not make the hot filament the cathode. It can therefore rectify its own current from an alternating source, but the maximum permissible energy input is then reduced by loss of complete rectifying power, due to electron emission from the hot focal spot on the target. In tubes which do not focus, the energy input which the tube will rectify completely, can be increased to any desired amount, simply by increasing the anode surface.

The discharge current through the tube depends primarily on the filament temperature and responds instantly to changes therein. In a particular case, values of discharge current and filament temperature were as follows, the equivalent spark gap varied from 4 to 14 cm. and the focal spot was practically constant at 3 mm. diameter:—

Filament temperature.		Discharge current.
1920° C	Absolute	1 milliamps.
1980° C	,, ...	1½ to 2½ ,,
2020° C	,, ...	3 to 5 ,,
2060° C	,, ...	5 to 10 ,,
2100° C	,, ...	11 to 20 ,,
2120° C	,, ...	20 to 34 ,,

These figures show the current to be practically independent of voltage and always the saturation value. The characteristics of the tube give no evidence of positive ions; the discharge is purely thermionic in nature. If the filament temperature be low, the number of electrons and the saturation are small. Increase in impressed voltage then causes no increase in current, but simply increases the hardness of the X-ray emitted. At higher filament temperatures, the special density of negative electricity in front of the cathode (in effect a back e.m.f.) exerts a surrent limiting effect which can, however, be avoided by suitable design and at the high voltages employed in Rontgen tubes.

The quantity and quality of rays from a Coolidge tube can be varied independently and over a wide range. Varying the resistance R (fig. 3) controls the filament temperature and hence the quantity of cathode rays (assuming the high-tension supply to be of adequate capacity). Adjusting the applied p.d. controls the hardness of the X-rays emitted, but not their quantity, since this depends entirely on the filament temperature. Since there are no residual gases in the bulb, heating is very slow and 20 or 30 milliamps. can be passed through the tube indefinitely with no change in the tube characteristics. As much as 100 milliamps. can be passed for a few seconds and the equivalent spark can be adjusted to anything from 1 to 10 inches, so that one and the same tube can be adapted to such different requirements as those of screening an abdomen or photographing a child's hand or a horse's leg.

The focal spot on the anode is practically constant in size and fixed in position. The elimination of secondary cathode ray bombardment (evidenced by the fact that the glass does not fluoresce) practically eliminates the useless and disturbing X-rays which emanate from the glass of an ordinary tube. Since the full supply of electrons is available directly the discharge circuit is closed, the starting and running voltages of a Coolidge tube are identical. When excited from a source of constant potential, the new tube yields a strong homogeneous bundle of primary Rontgen rays, even though the discharge be intermittent. The only limitation to the new tube is the ionisation of tungsten vapour and consequent decrease in tube resistance which occurs when the input is so great and the focusing so sharp that the target is volatilised at the focal spot. The new tube has many important applications in radiographic, diagnostic and therapeutic work and its introduction marks an important advance in Rontgen-ray apparatus and practice.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Financial Control of Electricity Supply Undertakings.

To the majority of engineers and managers of fairly large municipal electricity undertakings, the suggestion of unity of control contained in the report to the Southampton Corporation by such "experts" as Sir John Snell and Mr. Ernest Edmonds, F.C.A., should be most welcome. From time to time correspondence has appeared in these columns on this subject, but it does not seem to have been thoroughly thrashed out. Only those who are in charge of electricity departments where part of the administration is carried on under the supervision of the engineer and manager, and part under the Council's accountant, know the difficulties, and more often the chaos, which arises through such an arrangement.

The enormous amount of correspondence entailed (which to a great extent is unnecessary) is a sheer waste of time and terribly inefficient, and it would take up too much of your valuable space to enumerate the different ways in which certain work overlaps, and consequently is duplicated. Further, it is very well known that information is not always too cheerfully given by some Council accountants.

A manager of a commercial department of a local authority ought to have all the financial details at his finger ends, including the collection of moneys. Many a bad debt of considerable magnitude has been incurred through one department not knowing

what the other has been doing with consumers, and when the electricity department is consulted it is generally too late. Keeping in close touch with consumers is of vital importance, and for this to be done thoroughly the remedy is obvious.

Where there is a competent accountant in charge of the office (as is the case in most undertakings), why should not the work be done by the electrical staff, who, by the way, are better acquainted with all matters appertaining to consumers than the practically disinterested employés who are only partly engaged on electricity work in the accountant's department?

The disunited control of commercial undertakings should be condemned by all progressive municipal authorities; one great obstacle to smooth working is the amount of unnecessary red tape introduced by most borough treasurers, which only mars the progress which managers are striving their utmost to achieve.

The true functions of a borough treasurer's or accountant's department should be the systematic internal checking of the books and records, by which they would accomplish far more useful work. It is admitted that the details as to the raising of loans, &c., should be under the direct control and supervision of the borough treasurer or accountant.

If the Corporation of Southampton adopts the suggestion offered by the engineering and financial experts before mentioned, then municipal engineers and managers of electricity undertakings should endeavour to follow this progressive lead, and do all in their power to convince the members of their Councils that unity of control is absolutely essential to efficient working, and so bring about a much needed reform in the administration and management of this particular branch of revenue-producing undertakings.

Efficiency.

War and the Enemy.

After perusing the correspondence in the local Press, I was naturally keenly anticipating your remarks regarding the contract which some two or three weeks ago was ratified by the Leeds Corporation for the large steam generating plant.

It is regrettable that a large body like the Leeds Corporation are so lacking in patriotism and a sense of justice as to help the alien enemy by placing a contract to the magnitude of £30,000, one-third of this contract only being placed with a British firm; the remaining two-thirds being captured by firms controlled by German capital.

However, we understand that the Kaiser has recently ordered a very large number of Iron Crosses, and we have no doubt the members of the Leeds Corporation Electricity Committee will be receiving this decoration from the Kaiser in due course. Or can it be the fact of their placing this contract with German firms ensures the city of Leeds immunity from an attack of Zeppelins? However, perhaps the electors of Leeds may have something to say next month, and we wonder if, when the plant is formally started up in the year 1918, the Corporation will have a full dress ceremonial and invite the German Royal family to be present.

Yorkshire Tyke.

[As the contract referred to was placed before the end of July, we fail to see what bearing it has upon the question of trading with the enemy.—Eds. Elec. Rev.]

Special Constables.

While agreeing with you that it is inadvisable to say too much about the special precautions being taken for the protection of electric generating stations, it may be as well to let undesirable persons who may contemplate an "unauthorised" entry into these premises know that they will not be "up against" the ordinary middle-aged "special."

As an illustration of only *one* precaution taken here (and to my knowledge in other stations as well), we have taken three shooting ranges fixed up in the generating station and sub-station subways for practice with the '38 revolvers served out to our guards. Nearly every man is now proficient in the use of these weapons.

The object of this note is to suggest to any station engineer—if there is one—who has not armed his guards, to do so at once.

A. Hugh Seabrook, *General Manager.*

Borough of St. Marylebone
Electric Supply.
October 12th, 1914.

"Advertising and Progress."

On my own behalf allow me to express my kind thanks for Mr. Barham's appreciation of Mr. Hole's and my book. Mr. Hole is, unfortunately, away as a volunteer in the Russian Army, or, perhaps, his facile pen might have explained more clearly to you why "Advertising and Progress" was written.

If your reviewer came into contact in connection with advertising with as many people as I do, the question would never have been put. The average business man in this country still regards advertising as an increased cost on the article, and not as part of the selling expense. I could quote you chapter and verse for this statement, which is certainly not made at random. It is the most difficult thing possible to make the manufacturer or trader realise that advertising is part of the selling machinery, and replaces more obsolete methods of distribution, and replaces those methods at less cost than previously.

John Hart.

London, W.C., *October 12th*, 1914.

British Manufacturers and German Trade.

There are endless letters on this subject, but few with any tendency to improve existing conditions.

In the first place, to depose the Germans after the war we must be prepared with cheap and good articles to take the place of their specialities, and above all, the British manufacturers must revolutionise their methods of sale.

In the past British manufacturers have made little effort in their selling organisations as compared to Germany and America, and under existing conditions the people that will mostly benefit will be the Americans, as they appreciate and are prepared to make good use of this opportunity.

It is unfortunate that in this country with many manufacturers there is continual friction between the salesmen and the works staff, arising chiefly from the cause that British firms have, in many cases, not admitted the superior position that salesmen should occupy, and the attention that their expression of opinion should receive; this friction is aggravated by the continual employment of correspondents at the works who have never been salesmen, and who never knew or never will appreciate the difficulty of developing and promoting trade, and immediate efforts should be made to improve in this direction if we are to succeed.

We have also the growing system of manufacturers who are short of funds, or who pay no heed to their sales organisations, or, having none, seek to employ a large number of agents on commission only to make up the discrepancy. Here, again, there must be complete change; good salesmen should only be employed on this very important work of promotion and extension, and they must be provided with reasonable and ample funds to carry out what is expected of them, being rewarded by commission or in other ways for their success. Payment by commission only for such a purpose is a system of sweating important labour, which completely destroys the sympathies that should exist between salesmen and the works staff.

Again we have the want of confidence existing between commission salesmen and agents and their principals arising, perhaps, in the first stages at the works from neglect or want of method, but it must be said with regret in many cases from other reasons, and from complete failure to appreciate the necessary position of salesmen to achieve their object. It would be of great interest to know the proportion of good salesmen and agents that prefer, or have been forced, to sell foreign goods for this reason alone, although their natural instincts are patriotic in the extreme.

Lastly, we have the payment of salesmen. It is an admitted fact that the works employés must be paid weekly or monthly; not so the salesmen and agents on commission, as many firms seem to think weeks, months and years may elapse before they are paid, and by this short-sighted policy they send trade and the salesman's sympathies abroad in hundreds of cases.

Victor H. Coates, M.I.Mech.E.

London, S.W., *October 7th*, 1914.

No Reply.

In your issue dated October 2nd, there appeared an advertisement concerning a position of tramway car repair superintendent, for which application had to be made to Box 705, Electrical Review. I answered that advertisement, and up to the present have not received a reply. Surely honesty, let alone courtesy, demands a reply when a stamped addressed envelope is enclosed, and it is certainly no trouble, if pushed for paper, for advertisers to write on the flap of the envelope. I have answered about a dozen advertisements in your paper, enclosing a stamped addressed envelope, and in no instance have I received a reply. I have, therefore, naturally come to the conclusion that some, at any rate, of the advertisers' own engineering experience is limited and confined to steaming stamps off envelopes.

H. T. Gerry.

Portsmouth, *October 12th*, 1914.

[While we sympathise with our correspondent, who appears to have been exceptionally unlucky, we may suggest that possibly a very large number of replies was received—it is not uncommon for as many as 200 replies to a single advertisement to be sent in—rendering it practically impossible to acknowledge them all, especially where the clerical staff has been depleted owing to the war. Moreover, while most people would endeavour to acknowledge applications that were accompanied by stamped envelopes, it should not be assumed that even in this case the applicant has a *right* to a reply.—Eds. Elec. Rev.]

Stolen Electric Plugs.—Before the Recorder (Sir Forrest Fulton, K.C.), at the Central Criminal Court, on Tuesday, James Bernard Fay, 33, clerk, was brought up in custody and charged with stealing a parcel of electric plugs. Mr. A. H. Bodkin, who prosecuted, said that on October 3rd last, the British Xylonite Co. handed a parcel of plugs to the Midland Railway Co. for carriage to Manchester. The parcel was placed on a truck at St. Pancras Station, when the prisoner was seen to take up the goods and walk away with them. The prisoner pleaded guilty, and several previous convictions were proved against him. A sentence of 20 months' imprisonment was passed, and the Recorder directed that the goods should be handed over to the owners.

D

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

B.T.H. Transformer Oil Dryers and Filters.

The British Thomson-Houston Co., Ltd., of Rugby, has placed on the market oil filtering and drying plant for use in connection with transformers.

The reduction of dielectric strength of oil due to the presence of water or fine dust, especially metallic dust, is well known, as well as its reduced efficiency due to increase of viscosity, and the apparatus here referred to is for pumping the used oil under pressure through layers of dry white blotting paper contained in a suitable filter press. Most of the solid matter is caught by the first layer of paper, while the water is retained in the paper by capillary action. The filter consists of a series of alternate flat cast-iron plates and frames; the paper is placed between them and the whole clamped tightly by means of screw and lever.

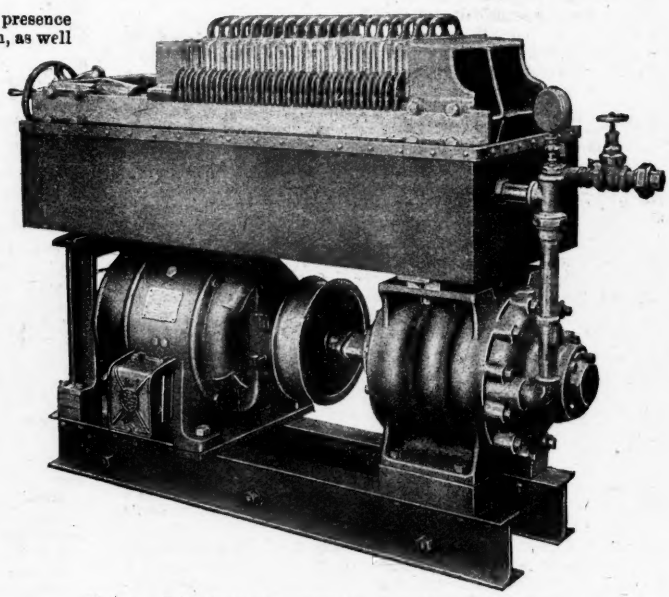


Fig. 1.—B.T.H. 20-Chamber Oil Dryer and Filter.

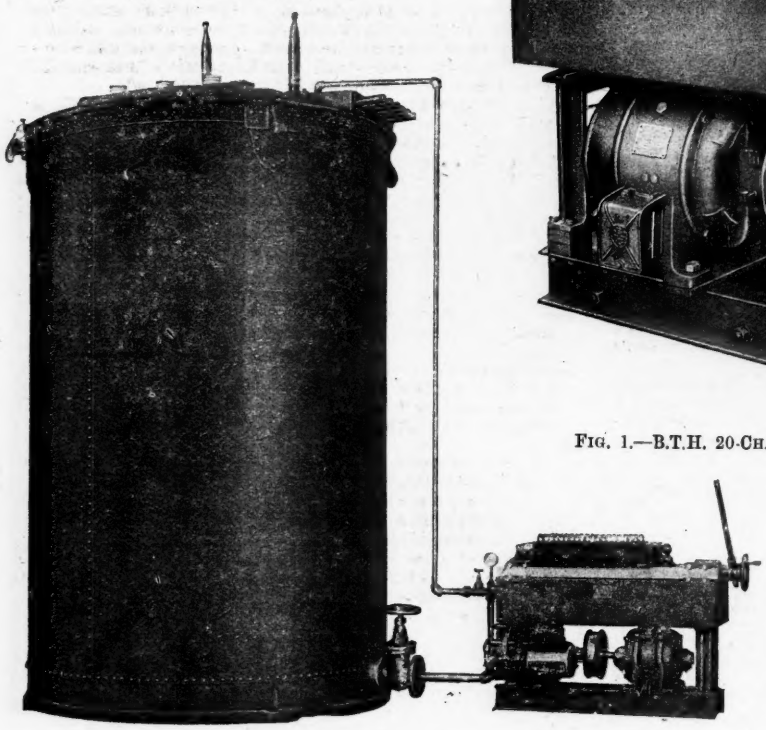


Fig. 2.—Oil Filter in Use, with Transformer in Service.

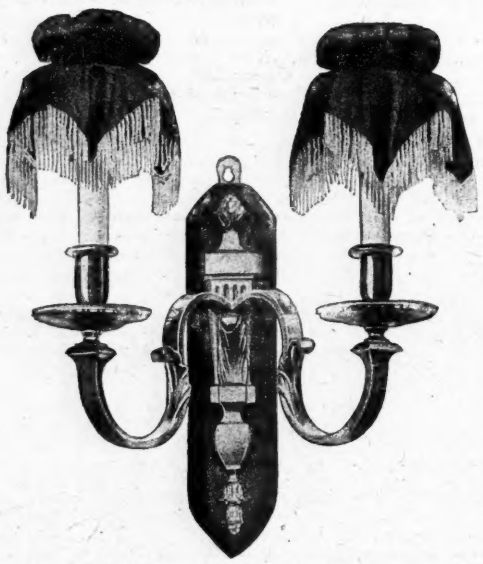


Fig. 3.—Two-light Candle Bracket.

Fig. 4.—Electrolier, with Lumina Bowl and Reflector.

Townshend's Electric Fittings.

Both plates and frames have large cored holes in the lower corners serving as oil inlet and outlet respectively, and the oil entering the filter chambers at one corner, passes through the filter paper, and away at the other corner. The plates and frames are very thin, and all connected so that the oil circulates in parallel, giving a large filter surface in a small space.

Two standard sizes are supplied—7 in. 14-chamber, and 12 in. 20-chamber.

Five sheets of dried and oiled paper are placed between each filter-plate and frame; the first should be renewed at intervals of ½ to 1 hour, depending on the condition of the oil, a new sheet being placed behind the remaining ones, and all should be renewed after three displacements. For the small filter a rotary-gear

positive-pressure pump is used, and for the larger one a multi-step centrifugal pump; these are coupled to either D.C or A.C. motors, pump and motor being mounted in the framework beneath the filter, as shown in fig. 1.

The B.T.H. Co. also supplies electric drying ovens for each size of filter paper, built of sheet steel and fitted with a suitable heater, thermometer and regulating rheostat.

An auto-transformer can be supplied to enable one oven to be used on varying A.C. pressures.

Fig. 2 shows a large transformer with the filtering apparatus attached. The required results are usually obtained by circulating the oil from two to five times, and this can be carried on while the transformer is in operation without the use of separate oil tanks.

The first figure shows a filter supplied to the Glasgow Corporation Tramways, where transformer oil in use for ten years, before filtering broke down at 1,500 volts; after once filtering, at 10,200 volts, and after twice filtering, withstood 20,000 volts, without breaking down; electrodes on test '05 in. apart.

The outfits are in use not only for transformer oil, but also for crude petroleum, insulating varnish, benzine, cylinder oil, &c.

The company also supplies a neat little hot air dryer for drying-out large transformers before filling.

This includes a motor-driven Sturtevant blower attached to a cylindrical heater and giving from 800 to 850 cb. ft. of air per minute at 185 to 212° F. with inlet air at 77° F. The heater is rated at 20 to 25 KW.

Townshend's Fittings.

In the accompanying illustrations, figs. 3 and 4, we show two examples of electric light fittings selected from the large number of these manufactures which are now being made by Messrs. Townshend's Art Metal Co., Ltd., of Ernest Street, Holloway Head, Birmingham, and which are included in their recently issued list of special designs for modern lighting schemes. Fig. 1 represents a two-light bracket highly finished in polished brass; it is in the Adams style, fitted with opal electric candles, and has a wooden back. In fig. 4 we show a handsome pattern of electrolier in the Greek style. It is in polished brass and has a 12-in. "Lumina" bowl and reflector; it is 4 ft. in length.

"Thermoid" Flexible.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., of Blomfield Street, E.C., have recently introduced a new type of flexible cord under the above title, which is specially designed for use with electric heating and cooking apparatus. It is provided with heat-resisting insulation and a flame-resisting external covering; the conductors are of steel and copper wire, combining strength with flexibility, and the cords will not kink. The "Thermoid" flexible is made to carry from 4 to 10 amperes, and should prove very useful, as the flexible connection has hitherto been the least satisfactory feature of portable electrical appliances, especially electric irons.

The "Safuse" Fuse.

Messrs. Donovan & Co., of 47, Cornwall Street, Birmingham, are introducing a fuse (known as the "Safuse") which they claim complies with Home Office requirements in every respect, and

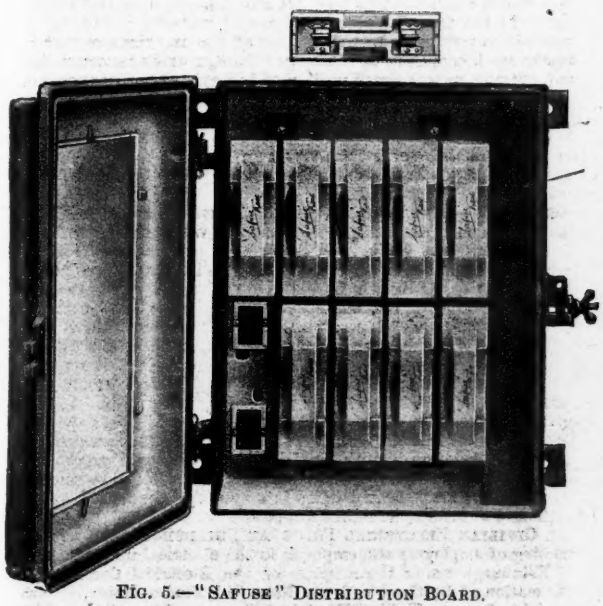


Fig. 5.—"Safuse" Distribution Board.
(Arrow indicates fibre shield covering main connections.)

is British-made throughout. Each unit consists of an English porcelain base into which the clips and terminals are recessed, the recesses being closed by unbreakable covers, slotted to receive the contact blades. A recess at the back of the base is provided for the bus-bars. The fuse-carrier of solid porcelain is so formed that the contact blades are shrouded, and cannot be inserted in the clips unless properly held, shock while inserting or withdrawing a fuse being impossible. The fuse wire passes through an asbestos

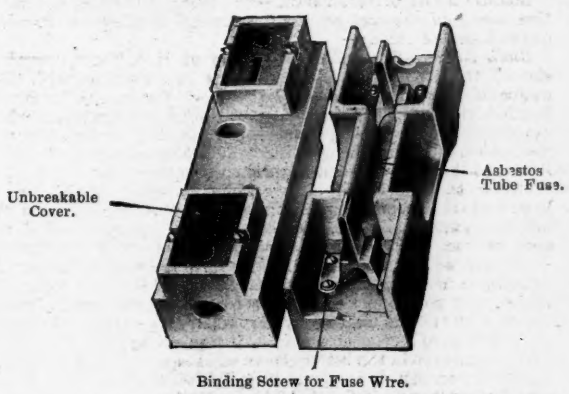


Fig. 6.—"Safuse" Base and Fuse Carrier.

tube; all binding screws are accessible, and no screws are tapped into porcelain. Figs. 5 and 6 gives a good idea of the construction employed.

LEGAL.

Renischel v. Dunbar.

In the City of London Court, on Tuesday, before his Honour, Judge Atherley Jones, K.C., an action was brought by Messrs. J. F. Renischel & Co., electrical engineers, 30, Fenchurch Street, E.C., against Mr. E. Dunbar, High Bank, Portland Crescent, Plymouth Grove, Manchester, to recover £6 16s. for an electric motor purchased by the defendant at a Manchester Exhibition.

Mr. Bircham, defendant's counsel, said that the contract was made in Manchester, and the electric motor was delivered in Manchester. The contract was made before August 4th. Therefore, the moratorium was a bar to the action proceeding. Further, the Court had no jurisdiction.

The Judge said that was the first time the point had arisen before him of an action being issued during the moratorium for a debt incurred antecedent to the moratorium. He thought that the proclamation was a prohibition to the case being tried.

Mr. Harry Strouts, plaintiffs' solicitor, urged that the moratorium was a statutory defence, and as it had not been pleaded it could not be raised then.

The Judge felt that the Court was bound to take notice of the moratorium. Otherwise it would be a very futile instrument if it had to be specially pleaded.

Mr. Strouts said he had come ready to try the case, and had a witness in attendance from Manchester.

Mr Bircham said that that being the case, he would waive the point about the moratorium, and the case proceeded.

Mr. H. B. Arnold, who was formerly in the employment of the plaintiffs as a traveller and agent, said that in May the plaintiffs had a stall at a Manchester exhibition, and he had charge of it. Defendant called and inquired about an electric motor, asking if it would be suitable to drive a washing machine. He said it would, and defendant asked what it would cost to fix. He recommended the defendant to O'Briens, of Manchester, who were competent electrical fitters. They put the price for fixing at £4. Defendant then agreed to pay £6 for the electric motor, and 16s. for a starter. Of course the £6 16s. did not include the cost of fixing the motor.

Mr. Bircham said that the motor could not be fitted, and was, therefore, useless to them. Plaintiffs told defendant that it would be suitable for driving a washing machine, and it was not. O'Briens told them it was no use fixing an electric motor in a wash-house.

Mr. Arnold was quite sure he had never told the defendant that he need not pay for the electric motor until it had been fixed and was in working order. If it went wrong it could not have been fitted properly.

Defendant said he was certain Arnold told him he need not pay for the motor until it was fixed and in working order. Arnold undertook to get it fixed for £4. The estimate from O'Briens came to £3 17s. 6d. O'Briens did the wiring, and the motor had been delivered, but they told him it was no use fixing it, as it would never work in a wash-house. It was an open motor, and as it was useless he objected to pay for it. It was not fit for the purpose for which it was bought, and which was known to the plaintiffs.

The Judge said he must find for the plaintiffs for the amount claimed, and he thought the case was important in regulating the relationship between vendor and purchaser. Defendant had not taken his objection within a reasonable time.

WAR ITEMS.

Board of Trade Assistance.—The following further information has been received at the Commercial Intelligence Branch of the Board of Trade:—

South Africa.—The Officer in Charge of H.M. Trade Commissioner's Office at Cape Town mentions in connection with the competition experienced from Germany in the import trade of South Africa, that it is essential that British manufacturers who are desirous of competing successfully in the South African market should realise the need for both the manufacture of cheap lines and their universal distribution throughout the Union. It is obvious that the better class articles, by which British firms have made their reputation, meet the needs of the inhabitants of urban communities alone, and are unsuited by reason of their cost to the needs of the rural population of the country. It is asserted that if British firms are to succeed in their endeavours to capture the competitive trade of Germany in South Africa, they must apply themselves to meeting the most minute requirements of the market, by manufacturing articles to which the public have become accustomed, irrespective of whether these requirements are in the better classes of cheaper qualities of goods. In this connection it is urged that British manufacturers must give their customers in South Africa credit for knowing the needs of the market, and must place implicit confidence in the South African merchant when he makes known his wants in regard to quality, finish, packing, supply of catalogues, &c.

France.—H.M. Consul at Lyons states that he has received from local firms inquiries for the names and addresses of English firms who could supply the following classes of goods in place of those formerly obtained from Germany, viz.:—Carbon for electrodes, cotton tape for insulating electric wires, aluminium articles, porcelain and fancy china, cut glass and fancy glass of all kinds. H.M. Consul urges on British manufacturers who wish to substitute their goods for German products in France, the importance of sending commercial travellers who will canvass the market energetically, of furnishing catalogues in French, with prices quoted free at customer's address, and of catering for the large demand for low-priced articles of all kinds.

Spain.—H.M. Consul at Corunna also points out the necessity for British manufacturers desirous of competing successfully with their German and Austrian rivals in the Spanish market to send out competent travellers. The Consul adds that catalogues in English, with prices in sterling, and weights and measures not in the metric system, are not appreciated, however well they are got up. In addition, terms of payment must be favourable to customers, to whom German firms have been very lenient in this respect.

Italy.—H M. Ambassador at Rome writes (September 13th) that at the present moment a very favourable opportunity is offered to British firms to recapture trade in Italy, and especially in Milan. It is stated that not only are importers very uncertain as to the extent to which Germany will be able to supply their demands in the future, but such a wave of antipathy to Germany and German methods has swept over Italy, while at the same time such enthusiasm for England and the English prevail, that there is a desire to deal with British firms and to boycott German trade. It is stated that if competent travellers or agents with a knowledge of Italian, and ability to quote prices in the metric system, were to visit Milan at the present time, they would be able to do an extensive business, and possibly to find new markets. There is stated to be a good opening for pig-iron.

Japan and Corea.—H.M. Commercial Attaché has forwarded detailed reports from H.M. Consular Officers in Hakodate, Formosa, Nagasaki, Chemulpo, Shimonoseki and Dairen, dealing with the nature and extent of German trade in their respective districts, and the possibilities of British products being introduced to replace German manufactures. The reports in question, which contain comparative statistics of the imports from the United Kingdom and Germany into the various districts, and information as to the various classes of goods in the supply of which German competition is most severe, may be inspected at the Commercial Intelligence Branch of the Board of Trade.

Further publications issued by the Board of Trade Commercial Intelligence Department concerning the export trade of Germany and Austria-Hungary to neutral markets deal with (No. 70) boilers and boiler-makers' wares; (No. 71), cement; (No. 75), scientific instruments and apparatus, except electrical.

What American Authorities are Saying.—As a result of special inquiries made in South and Central America concerning the trade position, the Pan American Bureau in Washington has issued a statement which appears in the financial Press. It is reported that "the acute financial stringency caused by the war has developed in many countries a critical condition which prevents them from now purchasing as heavily from the United States as they otherwise would. What the business interests there now need is not so much manufactured products or additional ships, although these are required to a considerable degree, but active financial help in the form of necessary money advances, reasonable credits and an actual market for their raw products which usually go to Europe. The general public are, therefore, cautioned against a wrong impression which may be gained from the numerous reports purporting to describe the Latin-American commercial field without pointing out the actual but unusual economic conditions. The real Latin-American opportunity at the moment is more one for co-operation, investigation and preparation for better times than for the actual sale of products."

In the above connection we may also refer to an address recently delivered to a Chicago meeting of electrical men by Mr. A. A. Gray, the managing editor of the American *Electrical Review and Western Electrician*. Mr. Gray has made a prolonged study of the general industrial situation in the United States, and according to a report published in his *Review*, he emphasised to his hearers the necessity for a thorough understanding of the obstacles which were present in an overnight conquest of foreign trade both in South and Central America and in the Orient. He suggested that the American manufacturer would work out for himself a considerable portion of grief if it were merely attempted to translate the usual catalogue and circular into Spanish and Portuguese or other foreign language and depend upon ordinary representation for the establishment of a trade connection. The consensus of opinion of the best informed experts with regard to opportunities for establishing a foreign market for American products indicated that the greatest degree of patience must be exercised. A considerable amount of money must be expended, and only a representative thoroughly familiar with the language and customs of the people in the foreign countries could hope to secure a favourable *entrée*, and a business connection which would be of an enduring character could be built up only after a great deal of missionary effort and satisfactory performance of initial service. It was with regard to opportunities in the United States that Mr. Gray laid his greatest emphasis. He finds a practically developed demand for a big volume of electrical apparatus. "Electrical supply jobbers in every part of the country were already beginning to feel the result of this demand, and up until August 1st every condition argued well for a most prosperous season. The upsetting of every calculation and good intention with the breaking out of hostilities in Europe will check this demand for some considerable time until readjustment is made. It is very likely, however, and every indication points to the soundness of the reasoning, that our manufacturing institutions are undergoing a rapid readjustment to meet the demands which will come about in this country, due to our inability to import many necessities, and due to the demands from abroad for a great many necessities that cannot now be produced in their former markets. Manufacturers in other industries generally are up to their capacity in their workshops, based upon a normal present demand. Any unusual volume of business means a desperate attempt to increase efficiency of production, and here the use of current-consuming devices, including electric lamps and motors particularly, will find ready acceptance.

"During the greatest period of prosperity in our last commercial boom manufacturers enlarged their plants without regard to the utilisation of electrical energy and current-consuming devices. To-day practically every manufacturer in every industry is absolutely sold on electric light and current-consuming devices, and in every extension, rehabilitation or new development that is contemplated at the present time, the use of electricity forms a fundamental part of the equipment.

"There is a quite little scare on, and a good many good men are out of jobs. If a man has a good position, it is advisable that he take good care of it. This is no time for anyone to get 'fresh.' And, if the electrical salesman has considered that he has had a pretty good working knowledge of the apparatus that he is handling, it is a good time now to look into every possible opportunity where his material may effect an adaptation which will mean greater economy in production, for it is along this line that profits to the manufacturer in other industries lie. In addition to the practically developed demand for an enormous quantity of electrical material, there are still thousands of applications of current-consuming devices that are only being conjectured at this time. If the manufacturer of electrical material and the sales man will exercise only a small portion of the imagination that is now at work conjuring up visions of foreign trade opportunities, and exercise only a small portion of the grim determination and courage that is about to be let loose with regard to this foreign trade invasion, and utilise some of this energy in stimulating the undeveloped demand for material right here in these United States, he will find that there is a trade conquest to be made, and a market available that are far beyond the possibilities of all the foreign markets of the world."

Belgium. — An Invitation to British Firms. — M. E. Janssens, partner of Energie and Lumière Works at Laeken, near Brussels, writes as follows:—"Being a partner in an important electrical manufacturing concern in Brussels I take the opportunity to point out to the British firms who are interested in the matter, that we were before the war relying on Germany for the supply of earthenware and china; electrical motors; arc lamps and carbons; carbon and drawn-wire lamps; hand lamps; lamp fittings (watertight and street lights), electrical bells and all the accessories (except wire); china or brass switches; steel tubing and accessories. The works are actually closed down, due to the hostilities, but as soon as the German army withdraws from the Belgian capital it is our intention to reopen. For that purpose we wish to get into touch with British firms who could export the above goods and ask for their names and addresses (to be sent to your paper). I will be in London in a few days' time and I would be pleased to meet their representatives."

A Civilian Electrical Force at Edinburgh.—At a mass meeting of employers and employés in the electrical industry, held in Edinburgh under the auspices of the Electrical Contractors' Association of Scotland and the Electrical Trades Union, it was agreed to form a Civilian Electrical Force for home defence, the membership of which would be open to those who, for some sufficient reason, were unable to take their places in the Regular Forces. The meeting, over which Mr. Basil A. Pilkington, chairman of the Edinburgh Branch of the Electrical Contractors' Association, presided, also called upon all suitable members of the electrical industry to volunteer for service in the Regular and Territorial Forces. Already there has been a good response to the appeal.

Imports into Australia.—We have just received from Mr. R. H. Butler, the secretary of the Australian Association of British Manufacturers and their representatives, Melbourne, a statement of the imports into Australia during the year 1913 of various classes of trade in respect to which our manufacturers are in competition with those of foreign origin. The value and percentage of imports from the United Kingdom, Germany and U.S.A. are stated in table form, and in the following we have extracted those lines which we think would interest our readers at this time. The value of the import trade in 1913 was £60,551,516, as the bottom line of the table shows. This represents an increase of over £20,000,000 since 1909—more than 50 per cent. While the proportion from the United Kingdom in 1913 compared with 1909 decreased by 4 per cent.—yet in "value" her trade increased by £12,600,000, double the combined increases made in their trade by Germany and the U.S.A., and exceeding by more than 4¼ millions the value of the increased imports from the whole of the rest of the world over that period. The United Kingdom share of the Commonwealth imports of competitive manufactured merchandise (1913) was 63·2 per cent. The percentages in the right hand section of the Table show the proportion of competitive merchandise of United Kingdom origin—taking into account imports from all countries of competitive manufactured merchandise—directly imported into each of the six States of the Commonwealth.

Northampton's Tramway Manager.—The special meeting of the Northampton Town Council to consider the position of Mr. J. Gottschalk, the tramway manager, was held on Monday evening. There is a large feeling in the town that Mr. Gottschalk should be deprived of his position because he was a German at the time of the outbreak of war, he having only recently obtained his naturalisation papers. The Council Chamber was crowded to its utmost capacity by the public, and the meeting lasted for four hours. The Tramway Committee had thoroughly considered the question at several meetings, and at a special meeting they reaffirmed their confidence in Mr. Gottschalk. Throughout the debate not a single personal charge was made against Mr. Gottschalk, and several tributes were paid to the way in which he has managed the tramway undertaking. A resolution calling upon the tramway manager to send in his resignation, and instructing the Tramway Committee to give him three months' wages in lieu of notice, was lost by 27 votes to 18. A further resolution that Mr. Gottschalk's services be suspended during the war without salary was lost by 28 votes to 18. There were several threats as to "what may happen" in the town if Mr. Gottschalk is not dismissed, and there is a possibility of November contests upon the matter.

Red Cross Kettle.—The Wigan Corporation electricity department has loaned an electric kettle to the local branch of the Red Cross Society.

Australian Imports.

Classes.	All countries.	U.K. origin. Value.	U.K. origin. Per cent.	Germany. Value.	Germany. Per cent.	U.S.A. Value.	U.S.A. Per cent.	U.K. origin. Imports into separate States. N.S.W.	Vic.	Q.	S.A.	W.A.	Tas.
								Per cent.					
Metals—Manufactured ...	£11,781,510	£8,308,788	70·5	£1,345,982	11·4	£1,642,086	13·9	65·9	69·0	75·6	80·0	78·3	72·8
„ Machinery ...	4,682,100	2,546,937	54·4	388,815	8·3	1,397,098	29·8	53·0	43·3	69·9	55·3	72·7	58·1
„ Misc. manufactured ...	5,201,995	3,535,079	67·9	394,013	7·6	659,618	12·7	62·7	71·5	41·5	78·8	78·2	65·9
„ Bars, rods, blooms ...	1,488,408	957,888	64·4	284,087	19·1	81,976	5·5	72·1	48·9	81·1	58·9	85·0	85·8
„ Pig and ingot... ...	310,773	241,740	77·8	7,145	2·3	25,949	8·3	81·7	67·3	82·2	84·8	83·1	98·0
Earthenware, cement, china, glass, &c.	1,580,615	655,778	41·5	458,007	29·0	64,482	4·1	41·8	43·3	31·9	40·5	40·7	62·5
Leather—and manufactures of	695,451	271,818	39·1	88,204	12·7	309,532	44·5	35·1	26·8	77·5	66·8	83·8	92·6
India-rubber—and manufactures of	769,001	243,351	31·6	259,346	33·7	125,539	16·3	39·0	22·1	38·3	37·0	66·0	61·6
Instruments—Scientific, surgical, &c.	754,589	333,179	44·2	114,318	15·1	234,472	31·1	41·3	40·7	54·3	61·9	78·4	55·6
Totals (including textiles and many other lines not indicated above	£60,551,516	£38,285,340	63·2	£6,886,441	11·4	£7,125,145	11·8	61·2	60·6	67·9	69·1	70·0	71·8

Bruce Peebles and the War.—Mr. Robert Shaw, A.M.I.E.E., chief estimating engineer to Messrs. Bruce Peebles & Co., Ltd., Edinburgh, has joined the engineer units of the Royal Naval Division for active service abroad, and as he will in all probability be away for some little time, Mr. William Oliver, B.Sc., A.M.I.C.E., has been appointed to temporarily fill Mr. Shaw's position with the firm. Messrs. Bruce Peebles announce that since the outbreak of hostilities well over one hundred members of their staff and works have joined the forces, and unfortunately they have already received intimation that one of their men has been killed in action.

British-Made Now.—It was announced at a meeting of the Eccles Town Council last week that the Public Lighting and Electricity Supply Committee was taking steps to arrange that British firms should supply articles required which had previously been obtained from German firms.

German Exports.—In one of the last issues of *Elektroteck. Zeitschrift* are published some interesting details about the export of electrical machinery and goods from Germany to all those countries that are now in war, which show to what an extent the German electrical trade must suffer from the unsettled conditions at present obtaining. The figures in the following table represent units of 1,000 marks, or £50. It will be seen that 35 per cent. of the total exports went to the countries which are now Germany's opponents:—

German Electrical Exports.

Electrical goods.*	Austria-Hungary. 1913.	Austria-Hungary. 1912.	Belgium. 1913.	Belgium. 1912.	France. 1913.	France. 1912.	Great Britain.† 1913.	Great Britain.† 1912.	Russia.‡ 1913.	Russia.‡ 1912.	Servia.	
Dynamos, motors, transformers, armatures, rotary converters, &c.	4,952	5,494	4,484	4,118	2,994	2,665	4,852	3,468	8,530	5,623	31	127
Accumulators, cells, &c.	216	320	191	170	46	52	184	106	85	88	—	5
Cables	26	347	4,250	3,357	199	76	1,060	1,122	628	754	24	56
Arc lamps and ordinary lamps, searchlights	443	555	172	142	198	322	538	480	1,264	775	1	5
Incandescent lamps	4,532	4,011	2,377	2,156	2,624	2,607	4,458	6,467	8,810	10,061	45	54
Telegraph and telephone apparatus, safety and signal apparatus, &c. ...	1,021	958	1,110	735	723	585	1,870	1,263	2,078	1,893	54	18
Materials for heavy current	6,009	4,790	4,656§	3,001	7,600§	1,909	9,752§	2,743	9,720	5,991	20	71
Meters and registration apparatus, &c....	2,888	3,221	1,028	928	1,209	791	1,474	905	4,645	3,546	25	60
Insulated wire	266	208	1,718	1,431	299	179	6,160	4,540	886	829	70	5
Electrotechnical carbon‖	885	908	929	725	943	980	2,008	1,813	656	512	4	11
Total	23,329	22,663	21,745	17,510	18,391	11,540	34,421	24,381	39,601	31,792	292	446
Percentage of total exports ...	7·06	8·31	6·58	6·42	5·56	4·23	10·41	8·94	11·98	11·66	0·09	0·16

* Total German exports of electrical goods, 330,568,000 marks. † Gibraltar, Malta and Cyprus not included. ‡ Including Finland, to which went 3,983,000 marks, or 1·2 per cent. of the total exports. § Including electrical parts of internal-combustion engines for ships. ‖ Including a few non-electrical goods.

Ozone for Recruiting Purposes.—On the occasion of Mr. Asquith's recruiting speech at Cardiff on the 2nd inst., representations were made to those who were attending to the arrangements that the Premier was troubled with asthma, and that an ozone generator should be installed under the table at which he was to speak, for the purpose of giving him relief. At very short notice this matter was taken up by the Corporation electric supply department, and the local branch of the Edison & Swan United Electric Light Co., Ltd., who communicated with Messrs. Ozonair, Ltd., by telephone. The latter firm sent down one of their Type 27 Ozonair machines, and this was installed in an adjoining room, the ozonised air being brought by means of a tube to a position under the Premier's table. It is understood that the result was an unqualified success.

Over 50 per cent. of the staff of Ozonair, Ltd., have enlisted in the National Services; one of their men, who is a Naval Reservist, was among those who were fortunate enough to be saved from the *Hogue*, and he has now joined another cruiser.

"As Usual" While in Camp.—Mr. T. C. Curtis, principal of the Curtis Manufacturing Co., Conduit Place, Paddington, has joined the Royal Naval Division (Engineer Units), and is in the Naval Camp at Martin Mill, near Walmer. Business will be carried on as usual in regulating plain and paralleling resistances, dimmers, sliders and all standard work.

German Electrical Goods on Offer.—A correspondent sends us a copy of a circular letter, dated October 7th, that has been issued by the Manchester Branch of the Electrical Co., Ltd., offering very large stocks of cotton, silk and enamel-covered wires at highly-competitive prices. Our correspondent informs us that as the result of inquiries he learns that the wires offered are German, and he adds: "It appears to me, at a time like this, that it is a disgrace that this firm should be supported, when there is English manufactured wire to be obtained." As the matter is considered to be of interest to the public generally, we are asked to call our readers' attention to it.

At such a time as this, it is but right and natural that feelings of patriotism should incline us all to prefer British manufactures when we can get them, but the company named is not precluded under the Trading with the Enemy Act, from conducting its business here. Proclamation No. 2, Clause 5, says: "Provided that where an enemy has a branch locally situated in British, allied, or neutral territory, not being neutral territory in Europe, transactions by or with such branch shall not be treated as transactions by or with an enemy." (Elec. Rev., September 18th, page 391.) This is the legal position; whether German goods should be purchased under the prevailing conditions, at whatever price, is a matter for the individual conscience, provided that it is not possible for the money to get to Germany during the war.

Liverpool's Objection to German Firms.—At the City Council on the 7th inst., Mr. Alfred Gates objected to certain contracts for rail-welding, &c., between the Tramways Committee and two companies, which, though registered in England, were composed, he said, almost entirely of German shareholders. He moved that any orders under these contracts which were at the option of the Committee as regards time should remain in abeyance. He quoted from the German Press to show that in Germany English firms were being subjected to a strict boycott. Mr. S. G. Relton seconded the motion. Alderman F. Smith (chairman of the Tramway Committee) hoped an expression of views would be given by the Council, as when the question was settled the Committee might enjoy a little peace on the subject. The Council, he was sure, would have regard to their legal responsibility and would not be influenced by extracts from the German Press to adopt German ways. If they owed anything to the Germans the disposition would be to pay it as soon as was proper (some dissent). He thought that was the feeling in Liverpool (more dissent). His own advice to the Council was to give Mr. Gates any amount of sympathy, but not to give him any notes (laughter). In his opinion a company registered in this country could enforce its contracts, and he would be no party to giving those people an opportunity of recovering damages. Mr. Burton Ellis asked if the Council were legally obliged to go on with the work immediately. If not, he would vote against English money going to the Germans. The Lord Mayor suggested that the matter be referred back to the Committee so that the advice of the town clerk might be obtained. The town clerk expressed a similar view, and added that the Tramways Committee would meet later in the week, when he would be prepared to give his advice in writing. He explained that the resolution of the Committee authorising the issue of orders to the firms did not by any means cover the whole of the legal question. Mr. Gates's amendment was lost by 49 votes to 43, with the result that the contracts with the two firms will be observed.

Effects in Canada.—Our contemporary, the *Power House*, says that the Canadian Westinghouse Co., Hamilton, Ont., has announced that, on account of the present unsettled condition of business throughout the Dominion, all outstanding prices and quotations on electrical apparatus and supplies unaccepted as at August 14th are withdrawn. "The necessity of this course is regretted, but that it is unavoidable, follows from existing financial conditions disturbed by the general European war, from the large increase in prices already registered in several lines of raw materials, and from the uncertainty as to a continuance of supply of various other elements of manufacture consequent on interruption of international commerce. An early improvement is hoped for on all points, and meanwhile the company will be glad to furnish quotations upon request at lowest figures permissible under the current conditions." The same contemporary says that the Canadian Tungsten Lamp Co., of Hamilton, Ont., has felt the effects of the war in a beneficial manner. "Many companies which secured most of their lamps from Germany have been forced to place their orders with the local concern, and sufficient orders to keep the plant running at a fair rate have been received. W. H. Ginder, manager of the plant, stated that, while the company had been able to secure trade which otherwise would have been given to German firms, it was facing a difficulty in that all of the platinum used in the manufacture of the lamps comes from Russia, and it is difficult to secure an adequate supply. The company has sufficient platinum to last a few months, and Mr. Ginder is hopeful that in the meantime further shipments will be received. The company is endeavouring to keep all its own men employed, and denies that a cut has been made. Owing to the difficulty in securing raw materials, the lamps will cost more, and a new price list is being issued."

Not German.—The Selson Engineering Co., Ltd., ask us to contradict the reports that are in circulation that their company is a German concern. The "company was registered in December, 1909, under the Companies' (Consolidation) Act, 1908, and is a strictly British concern both as regards capital and directorship. We manufacture in this country, having works both in Coventry and Halifax, whilst our staff and workmen, with only two exceptions, are British. Besides the tools of our own manufacture, we hold stock of a variety of American tools and machines for which we are the sole agents in this country."

"Trading with the Enemy" Questions at Oldham.—At the Oldham T.C. meeting on 7th inst., questions were asked by more than one member as to the status of certain firms with which the Corporation had dealings, the questioners being anxious to know if these were German firms. Councillor C. Hardman (chairman of the Electricity Committee) gave the result of correspondence with the firm which was to erect the new cooling towers at Greenhill. He said the Council might take it for granted that no set of men were more loyal than the members of the Electricity Committee. They learned that 22½ per cent. of the capital was owned by German subjects, and the company was formed in 1908. They had an order from the Admiralty, and a contract with a Sheffield firm, which, like the Committee, had some doubts. The Sheffield firm wrote to the Board of Trade on the matter, and the reply was that the injunction against trading with enemies attached only to companies incorporated in the enemy's country. If a limited liability company was registered in the United Kingdom, there was no objection to firms in Great Britain continuing to trade with it. The whole of the materials used in the construction of the cooling towers that the firm had in hand was being purchased from British firms, and the labour employed in the construction of the towers would be British. As to the batteries, they were being made at Dukinfield, and the Committee would not tolerate for one moment trading with a German firm.

In moving the adoption of the minutes of the Tramways Committee, Alderman Isherwood withdrew an account for the payment of £152 to a tire company. He said they had found that this was an entirely German firm, and the tires had been made in Germany, and the Committee did not propose to pay that amount at present.

Nationality and Naturalisation.

As a Scottish borderer myself, I hasten to apologise to Mr. G. E. Kerss for having suggested that he was not of British birth. My excuse must be that his name is so very uncommon, that there is only one instance of it to be found in the whole Post Office London Directory. It is of interest that Kelso, from which Mr. Kerss hails, is only a few miles from the estate and village of Swinton, from whence Mr. Campbell Swinton derives his name, and where his cousin is the thirty-fifth linear owner of the property, dating from Norman times. The family records extend over eight centuries.

I have every sympathy with Mr. Paul David, but still, I think, we should not take on unnecessary risks.

London, *October 12th*, 1914. John E. Gray.

I.C.S. Warriors.—The October number of the *I.C.S. Student* contains an illustrated description of the enrolment of the first contingent of the I.C.S. Corps, which is serving with the Royal Fusiliers in the new Army. The I.C.S. policy throughout the war will be to encourage every able-bodied man of military age to go to the Front, and, at the same time, to urge upon all who remain behind to work as hard as possible at their technical studies, so that they may the better help in the war on German trade.

It is stated that no fewer than 1,500 Australian I.C.S. students have joined the Australian Expeditionary Force.

Lieut. C. N. Spratt, of the R.F.C., is an I.C.S. student, and, according to the daily Press, he recently performed a remarkable exploit when reconnoitring at Montmorency. Sighting a German Taube aeroplane, he immediately gave chase, and, rising above the enemy, made him understand that he was covered by a gun. The German pilot, knowing himself to be out-manœuvred, offered, by means of gestures and signals, to surrender, and then volplaned downwards, but when nearing the ground he accelerated his engine and attempted to escape. The undaunted lieutenant, however, was prepared for this, and promptly dropped on the German at a height of 100 ft., both machines coming to earth with a crash. The German was hauled out of the wreckage severely injured, but Lieut. Spratt very luckily only slightly hurt his arm.

Personal.—Mr. Samuel Hulme, an employé at the Bury Electricity Works, and one of the survivors of H.M.S. *Hogue*, which was sunk in the North Sea, has left Bury again for headquarters.

News has been received at Patricroft that Mr. Fred. Ashcroft, of 17, Lime Street, who was employed at the Westinghouse Works, has been killed at the battle of the Aisne.—Mr. Jas. Bradburn, a Burnley Corporation tramcar driver, who has been serving with the Royal Field Artillery, has died at the Front.

Mr. A. M. Mulliner, assistant borough electrical engineer of Eccles, is serving with the Public Schools Corps (Malvern).

An Australian paper, dated August 29th, says that Mr. A. A. Hanson, son of Mr. A. J. Hanson (Lawrence & Hanson, electrical engineers, Sydney), who left Sydney in May, is under detention in the military prison at Paderborn, Westphalia.

Mr. L. B. Hogarth, borough electrical engineer at Whitehaven, has left to join the Royal Naval Division for active service.

Among the employés in the electricity department of the Hackney Borough Council who have joined the Colours are:—A. G. Hilling, distributing engineer (Royal Naval Division Electrical Engineers); J. Abfounder, labourer (1st Essex Regiment), and W. Elstone, arc lamp mechanic (not yet ascertained).

Recruiting Tramcars.—The Oldham tramway department has been running a recruiting car bearing 15,000 decorative lamps.

Trade with the Continent.—Mr. F. V. Wythes, A.M.I.E.E., of Paris, who has been handling English electrical and automobile specialities in France for several years, is desirous of getting into touch with British manufacturers of electrical and allied lines who wish to push their wares in France and other Continental countries. Prior to 1911 he was with electrical and engineering firms in England. Since that year he has travelled Holland, Belgium, France, Spain, Italy and Switzerland. Mr. Wythes, who is a member of the British Chamber of Commerce in Paris, is at present staying in this country, and communications should be addressed to him at Ravensden House, near Bedford.

BUSINESS NOTES.

Bankruptcy Proceedings. — Gordon Hill Boddington, a manufacturers' agent, late of 34-6, Oxford Street, W.—In the course of his public examination, held on October 6th before Mr. Registrar Linklater at the London Bankruptcy Court, this bankrupt stated that when he came of age in 1907 he became entitled to £16,500, most of which he lost by speculating on the Stock Exchange. He lost £1,000 in connection with a wireless method for controlling clocks within a radius of 1,000 miles from a central station, an invention by Mr. E. V. Gratze. He paid about £700 to Mr. Gratze, and expended the balance over the patent. In return he was to receive a one-half share of the profits. The Marconi Co., however, claimed that the invention was an infringement of their patents, with the result that no patent was granted to Mr. Gratze. The debtor was allowed to pass upon accounts showing total liabilities £9,882 (unsecured £2,778), and net assets valued at £1,027.

H. J. Godfrey, electrical engineer, 23, Lucien Road, Tooting, late 188, Balham High Road, London.—The public examination of this debtor was held at the Court House, Wandsworth, last week, when the statement of affairs disclosed liabilities amounting to £581, and assets estimated to realise £166, leaving a deficiency of £415. Questioned by the Official Receiver, the debtor said that his business had declined in recent years. He had lost money through under-estimating on contracts to the extent of £30 or £40 on one contract and £20 on another. He had kept no books. In October last he sued a certain man for £89 work done. A counterclaim was set up for bad work, and a sum of £36 paid into Court. The debtor paid £15 into Court. The case came before the Official Referee, who found for debtor £36, and for the counterclaim £53 and costs, less the £15 paid into Court. Debtor entered an appeal, which he subsequently withdrew, and the defendant proceeded under the original judgment. Execution was levied on August 31st, and the next day the debtor filed his petition. The failure was due to losses on trading in business, under-estimating on contracts, and loss over the legal action. The case was ordered to stand over.

Catalogues and Lists.—Messrs. L. E. Wilson & Co., 10, Corporation Street, Manchester.—Price leaflet relating to the new "Thomson" dry battery pocket lamps.

The Igranic Electric Co., Ltd., 147, Queen Victoria Street, London, E.C.—Illustrated leaflet (P 617) describes their new push-button control system.

Messrs. Stockall, Marples & Co. (1912), Ltd., 6-10, Clerkenwell Road, London, E.C.—Illustrated circular describing their Stockall card system equipment.

The Wardle Engineering Co., Ltd., 196, Deansgate, Manchester.—Supplementary catalogue, No. 9, giving particulars, prices and illustrations of a number of lantern fittings, including half-watt fittings for shop front lighting, "Streetlite," "Orient," "Primus," "Inverlite," "Workslite," "Opalba," semi-indirect bowl fittings, and the Barrow suspension device.

The British Thomson-Houston Co., Ltd., Rugby.—New price list, No. 4,221 (28 pages) giving very full information, with illustrations, regarding the B.T.H. automatic circuit-breakers for A.C. and C.C. circuits.

The Westinghouse-Cooper Hewitt Co., Ltd., 80, York Road, London, N.—Price list of ultra-violet ray water sterilisers for use in hospitals, &c., which are very easily installed, and in no way affect the taste or composition of the water.

Liquidations.—Garrett, Hartley & Co., Ltd., Morena Street Works, Catford, S.E.—Under a compulsory winding-up order, accounts have been lodged showing liabilities £1,369, assets valued at £1,000, and a deficiency of £1,519, as regards contributories. Mr. H. E. Burgess, Official Receiver, reports that the company was formed in June, 1913, with a capital of £1,500 to acquire as a going concern the business of Garrett's Engineering Co., carried on at the above address, and which consisted mainly of electrical installations, principally at cinema theatres. At the date of the winding-up order, two such contracts were in hand, but they were terminated by the liquidation. The operations of the company appear to have been hampered by mismanagement and shortage of working capital, and losses have been incurred by taking contracts at cut prices. The liquidation has been left in the hands of the Official Receiver.

Consolidated Diesel Engine Manufacturers, Ltd.—Mr. W. J. Warley, Official Receiver, presided over the first meeting of creditors and shareholders at the Bankruptcy Court on 8th inst. A resolution was passed appointing Sir W. B. Peat to act as liquidator, assisted by a committee of three creditors and two shareholders. At the meeting of shareholders it was stated that whilst a dividend was not an absolute impossibility, there was no prospect of it.

The Ecuador Telephone Co., Ltd.—This company is winding-up voluntarily, with Mr. W. G. Mare, secretary of the Chile Telephone Co., 42, Old Broad Street, E.C., as liquidator.

Book Notices.—"The Electrical Conductivity and Ionisation Constants of Organic Compounds." By H. Scudder. London: Constable & Co. Price 12s. 6d. net.

"Test Questions in Wireless Telegraphy." Series 1 and 2. London: Wireless Press. Price 1s. each set.

"Wireless Telegraphy." By A. B. Rolfe-Martin. London: A. & C. Black. Price 5s. net.

"University College (University of London) Calendar, 1914-15." London: Taylor & Francis.

"The Magnet of Commerce" is the title of a bulky book published by the Great Central Railway Co.'s Publicity Department, Marylebone Road, W. It contains a great deal of information concerning our output and exports of coal, the development of our coalfields, the making of coke, the preparation of coal for the market, its distribution, together with tables showing the collieries served by four of the great railways. Detailed information is given regarding Immingham Dock, its area, charges, distances from coasting ports in the United Kingdom, also a large coloured view of the dock, and a map showing the collieries and industries served by the G.C. Railway. The book is well illustrated, and is very informing.

Trade Announcements.—The Cambridge Scientific Instrument Co., Ltd., has taken over the business connection of the Leskole Co., Ltd., Palace Works, Enfield, who have gone into liquidation. Mr. F. Wakeham, the assistant manager of the Leskole Company, has joined the company's staff.

The offices of the British Radium Corporation, Ltd, have been removed to 71, Finsbury Pavement, London, E.C.

New premises at 42, Moorland Road, Weston-super-Mare, have been opened by Mr. Percy E. Culling, electrician, late of 19, Alexandra Parade.

For Sale.—The North British Railway Co. invite offers for eleven 20-ton electric traversers for railway wagons, with motors and other equipment and spare gear. Particulars are given in our advertisement pages.

Patent Restorations. — Orders have been made restoring the following patents:—G. A Newton and J. Smalley, "Improvements in furnace or firebars," No. 10,432 of 1907; "Improvements in firebars for steam boilers and other furnaces," No. 18,273 of 1906.

Patents and Alien Enemies.—Applications have been lodged at the Patent Office for the avoidance or suspension of patents Nos. 13,067, 13,068 and 13,069, 1906, granted to Schuster and Ast for electro-magnetic clutches, by C. E. Lugard, 76, Carlton Mansions, Maida Vale, London, W.; date of hearing, November 3rd.

LIGHTING and POWER NOTES.

Ainsdale.—E.L. Scheme.—The Southport Electricity Committee intends to carry out a scheme for the lighting of Ainsdale by electricity, and also to provide power for the air compressor station in connection with the Ainsdale sewerage. The R.D.C. has consented to the laying of the necessary cable.

Altrincham.—Street Lighting.—Progress is being made with the preparatory work in connection with the lighting of the main streets by electricity, and it is expected that the scheme will be completed by Christmas.

Bacup.—Street Lighting, &c.—The conversion of street lamps from gas to electricity is to form the subject of a report to be presented to the Electricity Sub-Committee.

The agreement dated March 15th, 1911, for the management by Rawtenstall of the Bacup electricity undertaking has now been terminated, and the management is now in the hands of the Bacup Corporation.

Basingstoke.—The E.L. scheme has been completed by the T.C., and the lighting of the town has been commenced this week. The official opening of the generating station took place yesterday.

Bexley.—Annual Accounts.—The result of the year's working of the electricity and tramways undertaking for the year ended March 31st, 1914, was a surplus of £348 on the electricity side, and a deficit of £910 on the tramways.

Blackpool.—New Plant, &c.—The electrical engineer has been requested to obtain tenders for the various works and plant required in connection with the extension of the electricity undertaking.

Showroom premises for the demonstration of the latest electrical heating and cooking apparatus are to be opened in Lytham Street.

Bradford.—Cable Extensions.—The Electricity Committee has authorised the extension of mains, principally to Esholt, at an estimated cost of about £6,000.

Carshalton.—Bulk Supply.—The U.D.C. has decided to withdraw its objection to the proposed bulk supply of electricity by the County of London Electric Supply Co., Ltd., to the South Metropolitan Electric Tramway and Lighting Co., and to submit certain points for amicable consideration by the local company.

Clewer.—Street Lighting.—The electric light is being introduced into the parish by a private company, and it is probable that it will be asked to tender for the public lighting in competition with gas.

Coniston.—Proposed E.L. Scheme. — Residents of this parish have recommended that a company be formed on lines suggested by Mr. Best, of Bradford, in order to provide a supply of electricity for the parish. The nominal capital will be £2,000, and the estimated cost of the scheme is £1,400.

Continental Notes.—Portugal.—A terrible explosion occurred recently at the Lisbon gas and electricity works. Eighty-six victims are now in hospital, while seven bodies have been recovered. It is feared that a search will disclose further bodies. The explosion affected the tramcar service, and in some cases passengers were burned by the electric current.—*Financial News.*

Norway.—It is reported from Stavanger, that the A/S Lysefaldene have applied to the Government for permission to postpone the work of harnessing the waterfalls belonging to the company for one year on account of various difficulties, which have arisen in consequence of the war. The work, according to the terms of the concession, had to be commenced on September 28th.

Dover.—At the request of the military authorities, the T.C. is laying a cable to six new blocks added to Fort Burgoyne. Terms have been agreed for the supply to the new pier station, and for a year's supply to the new Post Office; it has also been decided to give a supply from the tramway wires to the River Co-operative Society for charging electric vehicles.

Eccles.—Year's Working.—There was a surplus of £346 on the working of the electricity undertaking during the year ended March last. This has been carried to the reserve fund which now stands at £2,023.

The Public Lighting and Electricity Supply Committee is arranging with British firms to supply goods needed by the department, instead of German firms.

Flint.—Prov. Order.—A Sub-Committee entrusted with the consideration of the E.L. scheme for the borough, has recommended the T.C. to apply for a prov. order.

Gelligaer.—E.L. Scheme.—The U.D.C. has arranged to ascertain the cost of electricity for public and private lighting at Brithdir and Fochriw, from the Rhymney Iron Co. and the South Wales Electrical P.D. Co., before deciding upon terms received from Merthyr Tydfil.

Great Harwood.—Proposed Electricity Supply.—The U.D.C. is seeking an interview with the Blackburn Electricity Committee with a view to obtaining a supply of electricity.

Hazel Grove and Bramhall.—Proposed E.L.—The U.D.C. has engaged Messrs. J. Lomax, Kendal & Co., at a fee of £24, to undertake a canvass of the district for the purpose of ascertaining the probable number of electricity consumers.

Hessle.—Prov. Order.—The Hull T.C. has decided to apply for a prov. order for E.L. in the area of the Hessle U.D.C.

Hull.—Through Sir James Reckett's generosity the village streets of Swanland, near Hull, are to be supplied with electric light from the plant for lighting his residence, the Manor House. The village institute shortly to be erected, and the Congregational Church are to be similarly lighted.

Keighley.—New Plant.—The Electricity Committee has recommended the purchase of a 25-ton travelling crane.

Kendal.—The Electricity Committee has entered into an agreement to supply Messrs. McKay & Co. with 8,000 units per annum, at 1½d. per unit, as a day load.

Lanchester.—Proposed E.L.—The R.D.C. has decided to obtain powers to light the parish of Healyfield; it is suggested that the Knitsfield P.C. shall join in the scheme.

London.—The L.C.C. Finance Committee has recommended the Council to sanction the borrowing of £2,000 by Bermondsey B.C., for mains and meters.

At the L.C.C. meeting this week, it was agreed to give public notice of the Council's intention at its meeting on November 10th, to consider the promotion of legislation for carrying out the electricity scheme for London, which formed the subject of report by the Special Committee on London Electricity Supply in July last.

Luton.—Works Extension.—The Electricity Committee is making arrangements for the inauguration of the extension of the generating station, which is expected to take place about the middle of November when the works are completed.

New Zealand.—The Onehunga B.C. has under consideration a scheme to light the borough with electricity, at a cost of £7,000.

Oswestry.—Owing to the shortage in the supply of arc lamp carbons, the T.C. has decided as a temporary arrangement to light the Cross and the markets with metal-filament lamps.

Oulton Broad.—Street Lighting.—The U.D.C. has renewed for a year the public lighting contract with the electricity company, the terms being the same as last year.

Pickering.—E.L. Scheme.—The promoters of the E.L. scheme have requested the Council to allow the agreement, which stated that the works should be completed within two years, to be left unsigned for the present owing to the war. The Council decided to insist on the two years' period in the contract, and to give six months' grace at the end of the period if necessary.

Ramsbottom.—Street Lighting.—The U.D.C. has asked the Lancashire Electric Power Co. to submit an estimate for the lighting of Bury New Road, the Council to provide the standards.

Rhymney Valley.—The Electric Supply Co., Ltd., has applied to the Board of Trade for permission to use 230-volt overhead wires at Bargoed, Gilfach, Gelligaer Village, Pengam, Hengoed, and Ystrad Mynach, for the supply of energy.

Sheffield.—The Electric Supply Committee has decided on a site in Bow Street for the purpose of providing office and other accommodation for the department. The estimated cost of the buildings to be erected amounts to £43,000.

Southport.—The borough electrical engineer's estimate to supply and fix the necessary columns, wiring, &c., for the two 3,000-C.P. leading fixed lights for the Southport Channel, for the sum of £300 10s., has been accepted by the Channel Committee. The Committee is to pay £40 per annum for the current and maintenance of the lights.

Slaithwaite.—E.L. Scheme.—The U.D.C. has decided to proceed with an electricity scheme of its own, negotiations with Huddersfield Corporation and the Yorkshire E.P. Co. having failed, and is to engage an electrical engineer to advise the Council thereon.

Stockbridge.—Yorks. Power Co.'s Bill.—The Council has refused to meet a deputation from the company to discuss the proposed Bill to supply electricity in the district.

Swansea.—Annual Accounts.—The report of the electricity undertaking for the year ending March last, shows gross revenue £32,986, as against £29,765 for the previous year; and net profit of £3,312, as against £2,133. The total costs per unit sold amounted to 2·07d., as against 1·95d. for the previous year, the average price obtained being 2·16d. The balance of profit was carried to the reserve fund after transferring £1,000 to the rates.

Tavistock.—E.L. Scheme.—Owing to the war, there has been delay in the completion of the E.L. scheme, and the U.D.C. has asked the gas company to continue the public lighting for a period, the question of price to be settled by arbitration failing an agreement.

Teignmouth.—E.L. Scheme.—The Council has entered into an agreement with Messrs. Purvis, respecting an electric lighting scheme for the town, including Shaldon, the agreement to lapse if the prov. order is not obtained by the end of 1915.

Tunbridge Wells.—The B. of T. has granted the T.C. an order to supply current to premises at Speldhurst, Langton, Pembury, and Southborough. The Speldhurst P.C. has consented to overhead wires being used in the parish for the supply of current.

New Plant.—Arrangements to light electrically a portion of the military camp on the Lower Cricket Ground are being made. The engineer reports that it will be necessary, in the early part of next year, to install two additional boilers and a new water-cooling tower at the works.

Walsall.—The Electricity Committee has come to a satisfactory arrangement with representatives of local electrical contractors with regard to the exercise by the Corporation of powers contained in Sec. 52 of the Walsall Corporation Act, 1900 (Power to Supply Electrical Fittings). The Electricity Committee proposes to equip showroom premises, at a cost of not exceeding £100. The B. of T. has authorised the Corporation to supply current in part of the parish of Rushall.

The T.C. is again recommended by the Electricity Committee to apply to the L.G.B. for sanction to borrow £23,595 for the purposes of the electricity undertaking.

Warrington.—Prov. Order.—The T.C. has decided to apply to the B. of T. for a prov. order empowering it to supply electricity for lighting and other purposes in certain parishes in the rural districts of Runcorn and Warrington.

Waterford.—E.L. Scheme.—The Council has decided to proceed with the electric lighting scheme, and application is to be made to the L.G.B. for sanction to a loan of £30,000 for that purpose; the engineer has been instructed to prepare the necessary plans and estimates.

Watford.—Workhouse Lighting.—The Guardians are to consider the advisability of installing plant to supply electric current to the institution.

Weymouth.—Annual Report.—The accounts of the Corporation electricity department for the year ended March 31st, 1914, show a total revenue of £9,999, and expenditure of £5,992, leaving a gross profit of £4,007. The net profit on the year's working was £213. The number of units sold was 863,705, an increase of 211,840 on the previous year. Reductions in the price of current for heating, cooking and power, have been made, the price now obtained being 2·65d. per unit, as compared with 3·12d. The contract rate of charging has been introduced, plus 1d. per unit. The engineer reports that the works costs have increased from 1·01d. to 1·13d. per unit due to the extra cost of fuel, the total costs being 1·55d., as against 1·47d.

Proposed Loan.—The T.C. has applied to the L.G.B. for a loan of £2,100 for additions to the plant at the electricity works. The plant will not be supplied by public tender. Three firms have been asked for quotations, and these are being considered by the E.L. Committee.

Wood Green.—E.L. Scheme.—The Tottenham Power, Light and Heat Co. expects to be able to commence lighting the district by electricity at the end of the present month. The generating station, which is now complete, contains two (one 300-H.P. and one 175-H.P.) gas-engine dynamo sets, and a battery is being installed. The engines will operate on town gas supplied by the owning company.

Worcester.—A report on pumping at the sewage works by electricity and suction gas has been referred to the Water and Sewage Committee for consideration.

Wrexham.—Loan Sanction.—The L.G.B. has sanctioned the borrowing of £3,025, including £2,500 for an economiser, and £525 for an induced draught fan.

Ystradgynlais.—Prov. Order.—The District Council has decided to apply to the B. of T. for a prov. order to authorise the Council to supply electricity within the parishes of Ystradgynlais (Higher and Lower), and to acquire the undertaking of the Glantawe Electric Supply Co., Ltd.

TRAMWAY and RAILWAY NOTES.

Accrington.—The inquiry regarding the proposed Blackburn, Accrington, Whalley and Padiham Light Railway scheme has been postponed until after the war.

Australia.—Melbourne Railway Electrification.—The Victorian Railway Commissioners have appointed Mr. G. H. Wion, of the Pennsylvania Railroad Co., U.S.A., as engineer to assist in the installation and supervision of the power and automatic signalling system now being adopted in connection with the electrification of the Melbourne suburban lines. The appointment is for five years.

Balearic Isles.—La Sociedad General de Tranvias Electricos Interurbanos, of Madrid, has acquired the concession which was recently granted for the construction of an electric tramway between O'as Catala and Palma, in the Balearic Isles.

Bingley.—The newly-constructed tramway from Bingley to Crossflatts, which is to be worked by the Bradford Corporation, was inspected by the B. of T. last week, and is expected to be open in the course of a few days. The work completes the present tramway scheme in regard to Bingley. A further extension is delayed by difficulties in the road towards Keighley.

Bournemouth.—Proposed Loan.—The T.C. has applied to the B. of T. for a loan of £3,903 for the reconstruction of the tramway track in Holdenhurst Road, with an extra loop in Ashley Road.

Bradford.—The Tramways Committee has approved a plan for doubling the tramway track in a portion of Thornton Road. It has also decided to recommend the fitting of railless-trolley vehicles with patent earthing and automatic steering arrangements, at a cost of £14 a car, and to accept the offer of the Leeds Corporation to take over the obligations of the Bradford Council with respect to 10 of the railless-trolley vehicles now being constructed under contract for the latter authority.

Burnley.—There has been a decline of nearly £2,000 in the receipts from the tramways, compared with August last year, though it is pointed out that in August, 1913, there was an increase of £1,000, due to the Royal Agricultural Show being held in the borough. A number of cars have been taken off, and a saving effected of £760.

Continental Note.—France.—A tramway accident occurred in Paris on Monday afternoon, three persons being killed and several injured; the car left the track at a corner and dashed into a house.

Ealing.—The Special Tramways Committee of the T.C. has arranged with the London United Tramways Co. as to the removal of central standards, whereby it has been agreed that an estimate of the cost of removal should be prepared and forwarded to the Council, as the company declined to incur the expense unless an extension of its agreement was granted.

London.—Improving Tramway Receipts.—The total traffic receipts from the L.C.C. tramways, from April 1st to September 30th, 1914, were £1,149,838 as against £1,100,177 for the corresponding period of 1913.

The Council's proposal to do away with the tramway "dead end" in Waterloo Road by constructing a line through the New Cut to Blackfriars Road is meeting with much opposition in the neighbourhood, as it would involve the abolition of the New Cut market, one of the principal street markets of South London.

The L.C.C. Highways Committee has recommended the alteration of the existing and provision of additional coal bunkers, ash hoppers, &c., provision of new workshops, stores and office accommodation in connection with the Greenwich generating station at a cost of £17,700.

Mexico.—A strike of 1,200 motormen and conductors occurred on the Mexico City tramways last week. The men want double wages.

New Zealand.—Dunedin.—The manager of the Corporation Tramways, after visiting the Christchurch, Wellington and Auckland tramway systems recommends the Council to adopt the Auckland type for the proposed new cars.

Poole.—Railless Traction.—The T.C. has referred to a Sub-Committee of the Railways Committee for consideration and report a proposal by the Sandbanks Railless Electric Car Co., Ltd., to establish a system of railless traction with the co-operation of the Council.

Shelf.—The U.D.C. has expressed its willingness to enter into a new agreement, as suggested by the Halifax Corporation, similar to the one previously entered into with regard to the tramways.

Rotherham.—Loan Sanction.—The B. of T. has sanctioned the borrowing of £3,761 for the construction of tramways along Corporation Street (formerly Millgate).

Sheffield.—The City Council has been recommended to proceed with the doubling of the length of single track on the Shoreham tramway route.

South Shields.—The T.C., on the recommendation of the Tramway Committee, has decided to promote a Bill in Parliament for authority to run omnibuses outside the borough limits, and to include in the Bill application for power to extend the tramway system.

U.S.A.—According to the *Railway Review* (Chicago) a recent order of the New York State Public Service Commission prohibited the use of wooden cars for passenger transport with electric trains, after September 15th. The Long Island Railway is most seriously affected by this order.

Wigan.—Borrowing powers for £1,243 are to be sought for extensions of tramway loops at Orrell and Newtown.

TELEGRAPH and TELEPHONE NOTES.

Cables Cut.—It is reported that the five German long-distance cables, which all pass through the English Channel, were cut some time ago by the British, and the direct Anglo-German cables were disconnected. The German cables between the Azores and the United States, and between Yap, in the Caroline Islands, and Menado, Shanghai, and Honolulu, have also been silenced.

Censorship of Cable Telegrams.—We give below the terms of a protest lodged by the Commercial Cable Co. with the Government of the United States at Washington, on August 14th, 1914:—

A submarine cable differs in a very important way from wireless telegraphy. The wireless, communicating with a warship at sea, is the same as a warship cutting a submarine cable and taking the end on board and operating it.

The sending of cablegrams may be considered in the same light as traffic in supplies or munitions of war.

Our citizens are not prohibited from furnishing belligerents with supplies.

The citizens of neutrals may even supply belligerents with arms and ammunition without infringing the neutral status of the State itself.

A cablegram is in many respects similar to a letter, and it certainly is not the duty of any neutral Government to censor letters to a belligerent country. That would not be tolerated either by law or public opinion.

The secrecy of telegrams is preserved in many States by statutes, which make it a criminal offence to divulge their contents.

Judge Cooley, in his work on "Constitutional Limitations" (Seventh edition, pages 432-433), doubted even the power of a Court to compel a telegraph operator to disclose the contents of a message.

During the Spanish-American War, while the United States exercised rigid censorship, the nations, which are now belligerents, did not impose any restrictions on messages to or from the United States, or to or from Spain.

The Commercial Cable Co. would feel obliged to contest, as a form of unreasonable search, the placing of censors in its offices.

The company also issued the following letter to its principal patrons, together with copies of the foregoing protest:—

The Commercial Cable Co.,
Postal Telegraph Buildings,
253, Broadway, New York.
August 20th, 1914.

To our Patrons—

In view of the reported intention of the United States Government to place censors in the offices of cable companies when the United States is not at war, nor apprehending war, the Commercial Cable Co. filed a protest with the Government at Washington, on August 14th, 1914. We enclose a copy of such protest.

For 30 years the Commercial Cable Co. has preserved with the greatest fidelity the inviolability of cablegrams; has surrounded them with every safeguard; resisted attempts at inspection, and has taken every precaution to prevent their contents being divulged to any person whatsoever.

We do not believe our patrons wish their cablegrams to be subjected to the espionage of Government officials; not even on rare occasions.

There is a temporary financial benefit to the Commercial Cable Co. in eliminating code words and increasing the number of plain words by reason of a censorship, but we believe that in the long run the interests of the Commercial Cable Co. and the interests of its patrons are identical. We accordingly entered our vigorous protest.

If you care to express your views to the Government it might throw additional light on the subject from the standpoint of the cabling public.

THE COMMERCIAL CABLE CO.,
GEORGE CLAPPERTON,
Vice-President.

Norway.—The Bergen Telephone Co. decided some time ago to introduce a semi-automatic system at its telephone exchanges, and the installation of the new apparatus was to have been completed in the course of this year. When the war broke out the company was, however, notified by the contractors, a Belgian firm, that the work could not be completed according to the contract. Later on the contractors sent some electricians from Antwerp to Bergen to proceed with the installation, and those machine parts which cannot be got from Antwerp at present will be supplied from the firm's manufactories in England and America, so that it is expected that the work will be completed in the course of the spring next year.

Pacific Cable.—It is reported in the *Morning Post* that there is every probability of the traffic on the Pacific cable route being resumed at a reasonably early date. The *Nürnberg* damaged only the buildings and instruments on Fanning Island, which will soon be replaced. The authorities have been able to communicate the fact that the Island staff are safe.

Telephone Spy.—Reuter reports that recently the Russians entered a church, where they were courteously received by a venerable Psalm reader, and only accidentally discovered that there was a field telephone under the altar; the Psalm reader was a disguised Austrian officer.

Wireless Charge.—At West London Police Court, on October 8th, M. A. Watsdorf was charged on remand with establishing and working a wireless telegraph apparatus without a licence, and was committed for trial at the Central Criminal Court.

Telegraphists at the Front.—The *Times* prints a letter from a telegraphist on active service, from which we extract the following:—

"The Germans when retreating played havoc with the French lines, cutting the wires and cutting and burning the poles down, and that made it much harder for us to get rid of our work, as before we could do anything really our linemen, who are also P.O. fellows mostly, had to go out and put things a bit straight. We are constantly moving from place to place, so all our instruments are made to pack away, and in about half an hour after we get the word to close the office we are all ready to proceed to our next town. Further towards the front and linked up with us the messages are sent by a fellow on a cable cart, from which the line is laid down as they go along. The fellow works this with an instrument which sounds something like a bee buzzing, and one office is on the cart and another in a two-sided tent. Of course, this is all constructed for laying and taking up quickly, as the enemy may be very near, and sometimes you see them coming along at full gallop still picking up the cable. So you see there is a complete path from the landing place right up to the fighting, and as it is impossible to get letters about the country we do nearly all the correspondence."

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—MELBOURNE.—November 25th. Victorian Railways. 25 battery signal machines for operating signals. Contract 27,479. Contractors' Room, Railway Offices, Spencer Street.

December 2nd. Victorian Railways. 1,376 steel disk wheels complete for electric cars; steel disk wheel centres and steel tires for electric motor-cars; 1,376 steel disk wheels for electric motor-cars. Three separate contracts. Particulars from Contractors' Room, Railway Offices, Spencer Street.

ADELAIDE.—November 11th. Portable desiccating plant, petrol motor driven, for Postmaster-General. See "Official Notices" October 9th.

PERTH.—November 18th. 249 accumulators and power board, for Postmaster-General. See "Official Notices" to-day.

BRISBANE.—November 18th. Instruments and parts. See "Official Notices" October 9th.

December 15th. Switchboard, common battery, automatic or semi-automatic, for the Postmaster-General. See "Official Notices" October 9th.

SYDNEY.—December 9th. P.M.G. Time for tenders for various telegraph instruments and measuring instruments extended to December 9th.

The City Council has extended the time for the receipt of tenders for wet-air filters from October 26th to November 23rd.

December 21st. City Council. Motor-generators and switchgear suitable for electric vehicle battery charging. Specifications, 10s. 6d., from City Electrical Engineer.

Beckenham.—October 26th. U.D.C. Twelve months' supply of Midland small coal for the electricity works. See "Official Notices" to-day.

Birmingham.—October 26th. Electric light installation, Western Road House and Dudley Road Infirmary, for the B. of G. Messrs. Edwards & Shaw, engineers, 105, Colmore Row, Birmingham (returnable deposit of £5).

Blackpool.—Corporation. 24 cast-iron distribution pillars, H.T. and L.T. cables, earthenware conduit. See "Official Notices" October 9th.

Bradford.—October 17th. Corporation. Six or twelve months' supply of tramway stores. Forms of tender from the Tramway Offices, 7, Ings Road.

Colwyn Bay.—October 20th. Turbo-alternators and condensing plant; boilers, stokers, pumps, &c.; switchgear; cooling tower; crane; power station cabling and wiring; cables; rotaries and transformers, for the U.D.C. See "Official Notices" Sept. 25th.

Connah's Quay.—November 6th. U.D.C. (Contract 2) Gas engines, suction gas plant, pipework, cooling tank, dynamos, booster, switchboard, connections and storage battery. (3) Overhead and underground mains, services and public lighting. See "Official Notices" to-day.

Dublin.—November 5th. G.N. Railway Co. (Ireland). Twelve months' supply of stores, including a number of electrical items. See "Official Notices" to-day.

Heywood.—October 17th. Corporation. Converting plant, A.C. and D.C. switchgear and cables, battery booster, E.H.T. overhead line, E.H.T. switchgear for sub-station. See "Official Notices" September 25th.

Huddersfield.—October 21st. Corporation. Twelve months' supply of slack coal, for the Electricity Committee. Particulars from the Borough Electrical Engineer, St. Andrew's Road.

Leicester.—October 17th. Corporation. Steel plate, girders, steel troughing, &c., for the Tramways and Electricity Committee. Specifications from the Borough Engineer.

London.—October 28th. L.C.C. Installations, 160 wiring points, 200 lights, at Victoria School, Hammersmith; 126 wiring points, 170 lights, at Woolmore Street School, Poplar. See "Official Notices" October 9th.

New Zealand.—GISBORNE.—December 5th. Borough Council. Direct-current meters for electric lighting. (Deposit £25, to Town Clerk.) Specifications, &c., may be seen at Board of Trade Commercial Intelligence Department in London.

Pontypridd.—October 20th. U.D.C. 1,800 yards of ·4 concentric paper-insulated and lead-covered cable, for Electric Light and Tramways Department. See "Official Notices" October 9th.

Porth.—October 17th. E.L. installation, electricity and destructor works, Appletree, Porth, for the Rhondda U.D.C. Robert Hammond & Son, Engineers, 64, Victoria Street, Westminster, S.W. (Returnable deposit of £1 1s.)

Salford.—Erection of South Extension central car depôt, Frederick Road, Pendleton. Particulars from General Manager, 32, Blackfriars Street, Salford.

October 19th. Corporation. Purchase of 500 disused meters. See "Official Notices" October 9th.

South Africa.—November 2nd. S.A. Railways Administration. 14,080 incandescent lamps and 39,150 train-lighting lamps—all tungsten drawn-wire. Secretary to Tender Board, S.A.R. Headquarters, Johannesburg; and S.A. High Commissioner in London, 32, Victoria Street, S.W.

Spain.—October 19th. The municipal authorities of Posadas (province of Cordoba) are inviting tenders for the concession for the electric lighting of the town during a period of three years.

Tenders have just been invited for the concession for the working of the telephone exchange in the town of Valls (province of Tarragona) during a period of 20 years.

Tunbridge Wells.—November 7th. Corporation. 12 months' supply of H.T. and L.T. cables. See "Official Notices" October 9th.

York.—October 23rd. North-Eastern Railway. Twelve or six months' supply of telegraph apparatus, telegraph wire and line stores. See "Official Notices" to-day.

November 9th. Construction of about 1½ miles of light railway, excluding overhead electrical equipment, for the T.C. Mr. F. W. Spurr, City Engineer (returnable deposit of £5).

CLOSED.

Ashton-in-Makerfield. — Messrs. Johnson & Phillips have received an order from the U.D.C., in connection with the new sewage-disposal works, for an overhead line, switchboards, control panels and wiring for power and lighting.

Australia. — According to the *Melbourne Age*, the Prahran and Malvern Tramways Trust has accepted the following tenders in connection with supply of 20 single-type trucks and equipment :—

Contract No. 49.—Horrocks, Roxburgh Pty., Ltd., £594.
Contract No. 51.—Noyes Bros. (Melbourne) Pty., Ltd., £1,360.
Contract No. 56.—British Westinghouse Electric and Manufacturing Co., Ltd., £6,280; Australian General Electric Co., £1,7:0.
Contract No. 62.—Horrocks, Roxburgh & Co., for special work for car depôt at Kew, &c., £2,167.

Ballyconnell (Co. Cavan).—At a meeting of the Electric Light Co., tenders for the installation of electric light in private houses were considered. It was decided to give the contract to Mr. J. C. Cave, electrical engineer, Belturbet, at the following quotations: One light point, 16s.; two ditto., 18s.; three ditto., 22s.

Bradford.—The Electricity Committee has accepted the tender of the Lea Recorder Co., Ltd., for a water meter required for the turbines at the Valley Road electricity works, at £131; and that of Messrs. Holden & Brooke, Ltd., for a vertical spindle pump for new sump at Valley Road works, at £115.

The Tramways Committee has accepted the offer of Messrs. Cole, Marchant & Morley, Ltd., for 50 sets of patent power brake equipment, at £72 each; that of the British Oxygen Co. to supply oxygen required in the permanent-way department during one year, at 32s. 6d. per 1,000 cubic feet; and the tender of the British Mannesmann Tube Co., Ltd., for steel poles as follows:—220 light poles, at £4 11s. 10d. each; 80 medium poles, at £6 8s. 1d. each; and 10 heavy poles, at £7 8s. 7d. each.

Brodsworth. — The D.C. Tramway Committee has accepted the following tenders in connection with an extension of tramways :—

Four tramcar bodies, at £482 per car.—United Electric Car Co., Ltd.
Four electrical equipments, at £290 each.—Dick, Kerr & Co., Ltd.
Four Peckham pendulum trucks, at £102 each.—Brush Electrical Eng. Co., Ltd.

Dartford.—The U.D.C. has accepted the tender of Mr. T. Knight, of Sidcup, for extensions to the electricity works, at £1,695. The tender of Messrs. Stuart & Moore for extra appliances in connection with the electric fire-alarm system has been accepted by the U.D.C., making a total of £376 12s. 6d.

Gillingham (Kent).—The T.C. has decided to place an order for five transformers in the hands of the British Electric Transformer Co.

Gloucester. — The T.C. has accepted the tender of Messrs. Sully & Co. for the supply to the electricity works of 2,000 tons of best slack coal from the Lydney and Crump Meadow Collieries, at 9s. 8d. per ton.

London.—L.C.C.—The Main Drainage Committee reports that Messrs. Leakole & Co., whose tender was accepted for the supply of electrical resistance indicators for the superheaters of the new boilers at Crossness pumping station, have gone into voluntary liquidation owing to the war, and have transferred their business to the Cambridge Scientific Instrument Co., Ltd., who offer to take over the work at the same price, and upon the same terms. The Committee has accepted their offer.

The Stores and Contract Committee reports that the war is affecting to some extent many of the Council's contracts, a number of the contractors finding themselves unable, owing to unforeseen circumstances, to meet the full obligations under their contracts, and the Committee has considered as to the best means of dealing with the situation. In some cases the contracts have been terminated, and in a few other cases special arrangements have been made, each case being considered on its merits. Tenders or quotations for the supply of stores have from time to time been accepted from firms controlled wholly or largely by persons of German or Austrian nationality. The Committee, after making the necessary inquiries in each case, is arranging, if the facts justify that course, to cease dealings with the firms in question.

The Highways Committee reports the acceptance of tenders for the provision and laying of cables, laying of cable ducts, fixing of feeder pillars, &c., in connection with the re-arrangement of tramway sub-stations and sub-station plant. The following tenders were received, for supply and laying of high and low-tension cables :—

Western Electric Co., Ltd.	(accepted)	£24,002
British Insulated and Helsby Cables, Ltd.		24,524
Johnson & Phillips, Ltd.		24,690
Callender's Cable and Construction Co., Ltd.		24,824
W. T. Henley's Telegraph Works Co., Ltd.		25,100
W. T. Glover & Co., Ltd.		26,111
Siemens Bros. & Co., Ltd.		26,150

Laying of stoneware cable ducts, &c. :—

Foote & Milne, Ltd.	(accepted)	£2,368
W. Griffiths & Co., Ltd.		2,556
May, Mortimer & Co., Ltd.		5,971

For the installation of four induced-draught fans in connection with the Babcock & Wilcox boilers at the Greenwich generating station the following tenders were received :—

	For rope-driven fans.	For direct-driven fans.
Davidson & Co. Ltd.	£4,706	£5,353
Davidson & Co., Ltd. (alternative)	4,384	4,911 (with motors by Vickers, Ltd.) 4,898 (with motors by B.T.H. Co., Ltd.)
Standard Engineering Co., Ltd.	4,762	—
Turbon Patent Fan Co., Ltd.	4,875	—
James Keith & Blackman Co., Ltd.	4,996	5,471
Musgrave & Co., Ltd.	6,117	7,115

The Committee, on the recommendation of Messrs. Kennedy and Donkin, has accepted the alternative tender of Messrs. Davidson and Co., Ltd., for fans with motors, at £4,898. Permission was given to sub-let to the British Thomson-Houston Co., Ltd., the electric motors; to Messrs. Brook, Hirst & Co., the starting switchgear and resistances.

For supply of jib crane for the third section of the Central car-repair depôt the following tenders were received :—

T. Broadbent & Sons, Ltd.	(accepted)	£610
Babcock & Wilcox, Ltd.		795

Messrs. T. Broadbent & Sons were permitted to sub-let to the British Westinghouse Electric and Manufacturing Co., Ltd., the motors and controllers; to the British Insulated and Helsby Cables, Ltd., the cables, and to Messrs. T. Bolton & Sons, Ltd., the overhead line.

The Committee states that the contract of Messrs. J. Batt & Co. (London), Ltd., for the supply of 3,000 driving, and 2,000 pony wheel tires, for the Council's tramcars, at 19s. 4d. and 16s. 7d. each respectively, has been cancelled; the company proposed to sub-let the manufacture of the tires to certain German firms, and the following arrangements for tires to be purchased have been made :—

The Bessemer & Co., Ltd.—3,000 driving wheel tires, at 23s. each; and 2,000 pony wheel tires, at £1 each.
Cammell, Laird & Co., Ltd.—500 driving wheel tires, at 22s. each; 500 pony wheel tires, at 19s. each.

The undermentioned material has been purchased for use in the tramways department :—

200 pairs of motor-axle bearings; Anti-Attrition Metal Co., £200.
18,000 ft. rubber hose for magnetic brakes; D. Moseley & Sons, Ltd., £149.
6 tons of plain tread plate; J. Bellingham, £108.
1,200 carborundum blocks for rail grinding; Carborundum Co., Ltd., £263.
200 cast-iron yokes; Anderston Foundry Co. and J. Martin & Son (100 each), £139.
1 ton of tinned copper strip; London Electric Wire Co. and Smiths, Ltd., £97.
3,000 rail clips for extended yokes; Armstrong, Stevens & Sons, Ltd., £200.
Bolts, bars, clips, &c, in connection with the reconstruction of the lines in Seven Sisters Road, N.; Bayliss, Jones & Bayliss, Ltd, £563.
1,700 yokes; Anderston Foundry Co., Ltd., £1,132.

For the supply of 125,000 metallic-filament traction lamps the following tenders were received :—

Siemens Bros. Dynamo Works, Ltd.	(accepted)	£6,313
" " " " "	alternative	7,816
Edison & Swan U.E.L. Co., Ltd.		7,816
Electrical Co., Ltd.		7,816
G.E. Co., Ltd.		8,450

For the reconstruction of motor-generators in tramway sub-stations the tender of Messrs. Newton Bros., for £7,680, has been accepted.

Southwark.—The E.L. Committee proposes to purchase a 14-H.P. motor from the Electrical Co. at a cost of £37 3s. 6d.

St. Pancras.—The B.C. has referred back to the Electricity Committee the recommendation for the acceptance of the tender of Medway's Safety Lift Co. for an electro-oil lift with spare motor-driven oil pump, at £1,369.

Rotherham.—The following tenders have been accepted by the Electric Light and Tramways Committee for annual supplies :—

Chamberlain & Hookham, Ltd.—Upwards of 5-amp. meters.
Bastian Meter Co.—2½ and 5-amp. meters.
Callender's Cable & Construction Co., Ltd.—High and low-tension cables.
C. Kitson.—1,000 tons High Hazel slack coal, 8s. 9d. per ton.
J. Longbotham & Son.—1,000 tons Kilnhurst pea nuts, 8s. 8d. per ton.
Sheepbridge Coal and Iron Co., Ltd.—5,000 tons Glapwell Smitham coal 7s. 8d. per ton.
W. A. Durnford.—5,000 tons Barnsley Pit slack coal, 9s. per ton.
Tasker, Sons & Co.—Macintoshes.
Pocock Bros.—Oilskin coats.

Salford.—The Corporation has confirmed the recommendation of the Electricity Committee accepting a tender from Messrs. Willans & Robinson, Ltd, for a 5,000-KW. turbo-alternator with surface condensing plant.

Sheffield.—The following tenders have been accepted by the Electricity Supply Committee :—

Stirling Boiler Co., Ltd.—Complete sets of tubes for front banks of two Stirling boilers, £246; replace links for stokers of two boilers, £236.
A. Reyrolle & Co., Ltd.—14 panels of extra H.T. three-phase sub-station switchgear (extension of present contract), £1,682.

The City Council has been recommended to accept the tender of Messrs. Boving & Co., Ltd., to supply two electrically-driven turbo-sinking pumps, with necessary motors and other accessories; also the tender of Messrs. T. B. & W. Cockayne, Ltd., for the supply of fittings for aerial cables and for internal wiring and fittings to buildings, and the tender of the General Electric Co. for cables, insulators and lamps.

Watford.—The tender of the British Westinghouse Co. has been accepted for a supply of transformers at schedule prices.

Wolverhampton.—The T.C. has accepted the tender of Messrs. Turner, of Rochdale, at £150, for the covering of the existing coal-bunkers.

FORTHCOMING EVENTS.

Institution of Post Office Electrical Engineers.—Monday, October 19th. At 6 p.m. At Institution of Electrical Engineers, Victoria Embankment, W.C. Paper on "Ethics of Supervision," by Mr. A. S. Renshaw.

Physical Society of London.—Friday, October 23rd. At Imperial College of Science, South Kensington. Presidential address on "Ionization," by Sir J. J. Thomson, F.R.S.

NOTES.

Gas on Trains.—A mail train caught fire near Ballinluig, on October 2nd, and a gas cylinder exploded, causing serious injuries to the guard. No particulars are available to show whether the explosion was the cause or the result of the fire.

Colliery Winding Gear.—Electric winding is being adopted by colliery proprietors in Scotland, although there was much hesitation at first. Various systems were advocated, and this led to confusion. If a power company is near at hand the colliery owners are inclined to substitute electric for steam winding. In connection with the new pit framework of one of the Townhill Coal Co.'s old pits in Fife, it was decided as a matter of course to put in electric plant for winding as well as haulage, owing to the fact that the Fife Electric Power Co.'s central generating station is close to the pithead.

Two new installations at Scottish mines where, in both cases, old machinery has been removed to make way for modern plant, show different types of winders. One at the Breichshale pit of the Pumpherston Oil Co. was installed by Messrs. Siemens Bros., and is on the Siemens-Ilgner system, consisting of (*a*) a continuous current separately excited winding motor, direct coupled to a winding engine, comprising two cylindrical drums, each 8 ft. diameter × 2 ft. wide; and (*b*) a fly-wheel converter set. The other winder is at the Prestwick Colliery of Messrs. William Baird & Co., and is designed on the Thury principle. To prevent the peak loads coming on the three-phase supply, a balancing set is introduced in the winding motor house, common to the winding plant for both shafts. This is a three-phase motor operated from the power house, and constantly in motion. Mounted on the same shaft is a heavy fly-wheel, and on the other end of this shaft a direct-current generator, which supplies the current for operating the motors on the winding drums.

In fitting up new plant there is a considerable saving on first cost over steam, for the rotary converter, driving motor control-gear, and winding apparatus cost much less than boilers and steam engines. Winding by electricity also works out much more cheaply. The reduced winding costs and lower depreciation and interest on capital represent a satisfactory reduction in the cost per ton of coal raised. Winding is also easy and safe to manipulate.

Other Scottish collieries fitted include the South Kenmuir pits in the West of Scotland. The winders recently installed are on the C.M.B. system, for which Messrs. Crompton & Co. hold the patent; Messrs. Crompton have done much electrical work in South Wales mines. The gear is designed for a working depth of 160 fathoms. The cages carry two hutches apiece, the loaded hutches taking 17 cwt., so that with 65 winds per hour 55 tons of coal can be brought up hourly. The ascending load totals 57 cwt., and the descending load 23½ cwt., leaving 33½ cwt. to be dealt with by the winding gear. A 120-KW. motor-generator, working at 400 volts, is employed, the two winding motors used being of 150 B.H.P., running at 400 revolutions per minute. The maximum demand from the mains is found to be only a little over 120 KW., while the units per ton working from an 85-fathom level are only 0·8, which, with energy supplied at ¾d. per unit, gives the winding cost per ton at the low figure of 0·6 of a penny. The average winding speed of the plant is 1,120 ft. per minute, and the maximum 1,360 ft., with an acceleration period of 8 seconds, a full speed of 29 seconds, and a retardation period of 8 seconds. The banking time is 10 seconds, leaving the time for each wind at 55 seconds. With a day of eight working hours the lift is, therefore, 440 tons. The power supply in this district is three-phase alternating, 25 cycles per second, at a voltage of 440. This is directly coupled up to the rotary converter through a triple-pole oil switch with overload circuit-breaker attachment, while the motor has a wound rotor with slip-rings for starting, a liquid starting resistance being employed. The alternating current panel has mounted on it the usual volt and amperemeters, and also a voltage coil which connects the leads to the emergency trip gear of the brake. The main winding drum is of the spiro-conical type, designed to minimise the torque during acceleration. Control is by a regulator in the field circuit of the motor-generator, and by a reversing switch in the winding motor circuit, the two switches being connected so that before the motor can be reversed the current must be shut off and the brake applied. The magnetic brake is automatically applied as the controller is brought back, but comes into action of its own accord should any electrical failure occur. There is also an emergency brake actuated by a pedal.

Electrolytic Iron.—Referring to the paper by Mr. Guillet, of which an abstract was published in our issue of Oct. 2nd, Mr. S. Cowper-Coles wrote to the Iron and Steel Institute, stating that he considered the paper to be very misleading in regard to some of its statements. In 1908 he read a paper before the Iron and Steel Institute, entitled "The Production of Finished Iron Sheets and Tubes in one Operation," describing in considerable detail his electrolytic process for the direct production of iron tubes, cylinders and sheets. In that process a mandrel revolving at a critical speed so as to give sufficient skin friction between the electrolyte and the deposited metal was employed, to obtain a close homogeneous deposit and at the same time to enable a high current density to be employed, the solution being kept neutral by bringing it into contact with iron oxide, as described in Mr. Guillet's paper. In the following year Mr. Boucher approached him (Mr. Cowper-Coles) regarding the process, and obtained a licence to work it in France and Switzerland. A small trial plant was thereupon set up in Switzerland, and Mr. Boucher produced a number of tubes. A company was ultimately formed, called "Le Fer," to acquire the licence that had been granted to Mr. Boucher.

Mr. Cowper-Coles's object in setting out those facts was to show that all the preliminary work was carried out in Great Britain at great expense and with much labour. That that was so could hardly be gathered from the somewhat ungenerous statement, which constituted the only reference to the process in Mr. Guillet's paper.

His process was in no way analogous to the Elmore copper process, which as most people knew consisted of using an agate burnisher. He thought it should be known that the process described in Mr. Guillet's paper had been worked out in England, and that works were to be erected in the Midlands to carry out the process on a commercial scale.

Fatalities.—At Southport on Monday, an inquest was held on Emily Jane Lloyd (21), servant, who died on the previous Friday from injuries received in a lift accident at Westminster Buildings, Lord Street, Southport, last July. Annie Foster, who with her husband is caretaker of the building, had invited the deceased and a friend to ascend with her to her rooms, and, in the course of her evidence, said that she was already in the lift when the deceased put one foot inside, and the lift at once began to go up although witness had not started it. Witness stopped the lift by the emergency button, but, upon releasing her hand to assist the deceased, the lift again went up and crushed Lloyd. John Henry Stevens, architect, of Westminster Buildings, said that, although he was not an electrician, he had studied electricity, and understood most of the parts of this particular lift. It was installed in 1906 or 1907, and there had been no accident previously. On the Sunday when the accident took place, he had used the lift, and found it in proper working order. Under ordinary circumstances the lift could not be started without the entrance gate being closed, but he had known it to move when the gate had been opened, on account of a defect in the lock. After the accident he examined the lock, and found when opening the gate that a spring in the lock failed to act and to cut off the current as it should have done. He had looked after the lift, and had frequently tested it. He was not aware that there were two recent improvements that would have obviated an accident of the kind. He had never tampered with the machinery, and had only done what he had been instructed to do by the makers. The lift was insured, and one of the conditions of the insurance was that it should be regularly examined, and this had been done by a qualified electrician, the last examination prior to the accident being on May 11th. The jury returned a verdict of "Accidental Death," and said there was no one to blame.

The death of a boy named Ernest Taylor, (13), at the slag works of Messrs. John Crombie & Sons, Ltd., formed the subject of a Coroner's inquest at Middlesbrough on Friday last. A verdict of "Accidental Death" was returned, no blame being attached to anyone.

The evidence showed that the boy was on the roof of a structure at the works, when he apparently came in contact with some live wires above it.

The foreman denied that it was part of the boy's duty to look after a hopper on a platform near the roof. The bottom of the roof was 4 ft. above the platform, and 4 ft. separated the edge of the roof from the live wires overhead. The boy had no business on either platform or roof.

Dr. Benson, who conducted a post-mortem examination, stated that the symptoms pointed to death from electric shock. Artificial respiration had apparently been attempted for a short time.

The Factory Inspector, Mr. T. K. Evans, stated that he had known a great many cases of men being brought back to consciousness by continued artificial respiration. Nevertheless he thought the doctor's chance of resuscitation a poor one, once the efforts in this direction had been relaxed.

The Coroner remarked that while they could not blame the men for ceasing attempts at artificial respiration, he thought it would have been wiser to go on till the doctor arrived.

Leitner Electrical Co., Ltd.—In the Winding-Up Court, on Tuesday (October 13th), Mr. Justice Neville heard a petition by Messrs. Alfred Herbert, Ltd., for the compulsory liquidation of the Leitner Electrical Co., Ltd.

Mr. Uthwatt stated that the petitioning company was a simple contract creditor for £650, and that it was supported by creditors whose debts amounted to £4,000.

Mr. Whinney and Mr. Hunt, on behalf of other creditors, also supported the petition.

The company did not appear, and his Lordship made the usual compulsory order.

Institution and Lecture Notes.—Association of Engineers-in-Charge.—The following are the chief items in the programme for the coming Session of the above Association :—

December 9th.—"Electricity in the Printing Office." Mr. F. Broadbent.
" 12th.—Social dance.
January 2nd.—Social dance.
" 13th.—"Electric Accumulators." Mr. R. T. Mitchell.
February 10th.—"Boilers and Boiler Mountings," by Mr. Vernon Smith.
" 13th.—Social dance.
March 10th.—"Modern Steam Laundry Machinery." Mr. B. P. Flockton.
" 20th.—Annual dinner.
April 10th.—Social dance.
" 14th.—"Autogenous Welding." Mr. L. M. Fox.
September 15th.—Annual meeting.

Mr. Frank Bailey delivered his presidential address on Wednesday night.

Institution of Post Office Electrical Engineers.—The programme of this Institution for the Session now commencing includes :—

1914.—October 19th.—"Ethics of Supervision." Mr. A. S. Renshaw.
November 16th.—"Stores Accounting." Mr. W. T. Harris.
" " —"Cash Accounting." Mr. W. J. A. Payne.
December 21st.—"Power Circuit Interference with Telegraphs and Telephones." Mr. S. C. Barsholomew.
1915.—January 18th.—"Telephone Relays and their Application to Commercial Circuits." Mr. C. Robinson.
February 15th.—"Wireless Call Devices." Mr. L. B. Turner.
March 15th.—"Telephone Economics—Open Construction." Mr. H. A. Smith.
April 19th.—Annual General Meeting.

Manchester Association of Engineers.—On Saturday last a visit was paid by the Association to the works of the British Westinghouse Electric & Manufacturing Co., Ltd. Considerable interest was shown in the various manufacturing processes, and a large amount of work was in progress through the shops; the high degree of mechanical perfection attained in the manufacture and fixing of the turbine blading, and in the improved design of the vertical tandem gas engine, attracted special attention. Other interesting features were some examples of bent copper windings, insulating materials, fan and other small motors, and a display of electric supply fittings manufactured in the works. About 160 members of the Association attended. An admirable little book printed by the company specially for the occasion gave particulars of the departments and the jobs in hand, as well as a carefully arranged itinerary of the works.

Association of Supervising Electricians.—The first meeting of the 1914-15 Session was held at St. Bride's Institute, Ludgate Circus, on the 29th ult. Some 80 members and visitors assembled to hear the presidential address, which was followed by a paper dealing with "Private Generating Plants," read by the president, Mr. A. H. Dykes. A reference was made to the necessity of having an Association to bring into close touch with one another supervisors and foremen of the electrical contracting trades. The paper by Mr. Dykes showed a deep and intimate knowledge of his subject, and an interesting discussion followed, being the outcome of the varied experience of the members. A number of technical questions were answered by the lecturer. It is intended to include these with the paper, which is being printed and sent to all members. The Hon. Secretary announced a series of papers, which will be read during the session by authorities on the respective subjects, amongst them being "A.C. Commutator Motors," "Wiring Systems," "D.C. Motors," "Telephones" and "Lightning Conductors," and concluded by drawing attention to the inaugural dinner, which is to be held at the London Tavern, Fenchurch Street, on November 28th. Particulars of the Association and the rules can be obtained from the Hon. Secretary, Mr. C. J. Banister, 14, Pulborough Road, Southfields.

Institution of Electrical Engineers.—At the opening meeting of the Session on Thursday, October 29th, when the president, Sir John Snell, will deliver his inaugural address, a marble bust of Michael Faraday will be presented to the Institution by Mr. Llewellyn Preece, on behalf of the family of the late Sir William Preece, K.C.B., F.R.S., past-president.

Birmingham Wireless Association.—In his presidential address to the members of the Birmingham Scientific Society, last week, Mr. H. W. H. Darlaston announced that the Wireless Telegraph Association was now associated with them and shared their headquarters.

Physical Society of London.—Sir J. J. Thomson, O.M., F.R.S., will deliver his presidential address at the first meeting of the Society on Friday, October 23rd. The subject of the address will be "Ionisation," and the meeting will be held at the Imperial College of Science, South Kensington.

Stolen Metal: Sentence.—Before the Recorder (Sir Forrest Fulton), at the Central Criminal Court, on Wednesday, Alex. Farquhar, 39, metal spinner, pleaded guilty to stealing large quantities of brass and copper belonging to his employer, Mr. David Assersohn, electrical engineer, of St. Bride's Street. Counsel stated that the prisoner had been five years in the employ of the prosecutor, and was in receipt of a weekly wage, as a foreman spinner, of £2 15s. It was alleged that during the past two years prisoner had systematically robbed his employer of quantities of metal, which he surreptitiously removed to a workshop, and there made up and actually sold to his employer's customers. Prosecutor estimated his loss at £200. On his arrest there was found in the prisoner's possession a bank-book showing that he had saved over £200. The Recorder sentenced the prisoner to 15 months' hard labour, and ordered him to pay the costs of the prosecution.

London County Council.—It has been decided to raise the rate of pay of assistant night inspectors from 38s. to 40s. per week, rising by annual increments of 1s. per week to 45s., and of acting assistant night inspectors from 38s. to 39s. per week, rising after a probationary period of six months, not necessarily continuous, to 40s. per week. These changes have been rendered advisable by the fact that conductors, who are a lower grade of employés, are now receiving 39s. per week.

Some months ago the leading and ordinary cable hands in the Southern section, and the wiremen and wiremen's labourers employed in the electrical section of the tramways department, applied for an increase of pay. It was referred to the Conciliation Board, but no decision was reached. The question was, therefore, referred to a Court of Arbitration appointed by the Board of Trade, consisting of Right Hon. Sir David Harrel, K.C.B. (chairman), Sir Alexander Kaye Butterworth, Mr. Reginald J. Smith, K.C., Mr. C. W. Bowerman, M.P., and Mr. J. N. Bell. The Court met on July 16th, and on the following day decided that in all cases there should be an increase of ½d. per hour. The new rates, dated from July 20th, are therefore :—Leading cable hands, 8d. or 8½d. per hour, according as they were receiving 7½d. or 8d. per hour previously. Ordinary cable hands, 7½d. per hour. Wiremen, depôt wiring department, 10d. per hour as from May 14th last. Wiremen's labourers, 7d. or 7½d. per hour, according as they were receiving 6½d. or 7d. per hour on July 20th last. For night work add one halfpenny per hour in all cases affected by the above awards. The extra expense involved by the award is estimated at £510 for the present, and £720 during the next financial year.

It has been decided to refer to the Conciliation Board the question of advancing on the above scale the wages paid to leading and ordinary cable hands employed in the Northern section of the tramway undertaking.

Appointments Vacant.—Working assistant engineer, married (£89 + house), for Hants County Asylum; several junior assistant engineers (15s.), for Yorkshire Electric Power Co.; testing assistant (£91), for York Corporation Electricity Department; shift engineer (32s. 6d.) and a jointer, for Gillingham. Particulars are given in our advertisement pages to-day.

Inquiries.—Makers of machinery for manufacturing china and earthenware parts for electrical apparatus from the raw material are asked for; also makers of "Ohmio" metal-filament lamps, and makers of the C. Beyers electrical hairdrier.

Osmium-Platinum Alloy.—An alloy of osmium and platinum has been introduced in the United States, to take the place of iridio-platinum alloy, owing to the scarcity of iridium. It is stated that one part of osmium replaces two and a-half times its weight of iridium, and the alloy has a high specific resistance, combined with great hardness and tensile strength, and can be drawn into the finest sizes of wire.

Copper Contraband.—The British Government has agreed that there shall be no interference with American copper shipped to neutral countries, provided that the Governments of those countries give assurances that the metal will be used for domestic purposes only, and will not be re-exported. The Dutch Government has accordingly prohibited the export of copper.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Basingstoke T.C., on October 8th, appointed Mr. G. Broadhurst as electrical engineer, at a salary of £170 per annum.

There were 128 applicants for the post of borough electrical engineer at Swansea.

Mr. H. A. Harding, electrical engineer to the Bognor electricity undertaking, was married on Thursday, October 8th, to Miss Lilian E. Humphrys, eldest daughter of Mr. and Mrs. W. B. Humphrys, of Thornlaw Lodge, West Norwood.

With reference to our statement that Mr. T. B. Briggs, of Blackburn, had been appointed senior engineer-in-charge at Newport (Mon.) electricity works, we are now informed that the successful applicant was Mr. N. B. Macaulay, senior engineer-in-charge to the Rhondda Tramway Co., at Porth, Glam., South Wales, his appointment being made on Friday last.

The St. Annes U.D.C. has increased the salary of the electrical engineer by £50 per annum.

At a meeting of the Bexhill-on-Sea T.C., on Monday, it was announced that the electrical engineer (Mr. W. T. Le Feuvre) had applied for a commission in the Army. It was decided to keep open his post, and to refer to the Council in Committee the question of his salary, with power to act. The E L. Committee had recommended that his salary should be apportioned as follows :—£225 per annum to Mr. Le Feuvre and family, £100 per annum to the assistant engineer, (Mr. Frost), and £100 per annum to the provision for any further engineering assistance, should necessity arise.

Tramway Officials. — Bradford Tramways Committee proposes to promote Mr. Samuel Pearson, assistant works superintendent at the Thornbury depôt, to the position of works superintendent (in lieu of Mr. T. Richardson, resigned), at a salary of £150 per annum.

On the occasion of his marriage, Mr. P. R. T. Pearce, of the Bournemouth Corporation tramway staff, has been presented by his colleagues with a marble clock and a pair of ornaments.

General.—Mr. E. J. Reed, formerly sales manager to Messrs. Miles, Sykes & Son, Ltd., and for several years chief publicity writer to the British Westinghouse Co., has been appointed advertising manager to Messrs. Ed. Bennis & Co., Ltd., of Bolton. The offices of the publicity department are at 28, Victoria Street, London, S.W.

Mr. R. H. Burnham, telegraph superintendent, has just retired after 50 years' service in the South-Eastern and Chatham Railway. The duties are divided between the engineer and the superintendent of the line. During the present crisis Mr. Burnham has been appointed censor over the telegraph service message work.

Mr. John Hammersley, inspecting and supervising engineer, has been appointed resident engineer in Manchester for Messrs. Home-Morton, Kerr & Gibson, of Glasgow, Birmingham and London, consulting engineers and industrial works designers.

Obituary.—Mr. Albert Dobson.—We regret to learn of the death, which occurred on October 8th, after a serious illness, of Mr. Albert Dobson, who was long associated with the Aster Engineering Co. (1913), Ltd., as general manager and secretary. Mr. Dobson, who was in his 49th year, had been ailing for several months and very severely ill for some six weeks. He leaves a widow, two daughters and a son who is at present serving in the Territorial Force.

NEW COMPANIES REGISTERED.

Ballyconnell Electric Light and Power Co., Ltd. (4,198).—This company was registered in Dublin on October 10th, with a capital of £1,500 in £1 shares, to carry on the business of electricians, mechanical engineers and manufacturers, workers and dealers in electricity, motive power and light, &c. The subscribers are:—F. McKiernan, Cullilleenan, Ballyconnell, 50 shares; F. McGovern, Doon, Ballyconnell, merchant, 50 shares; E. Shannon, Doon, Ballyconnell, merchant, 25 shares; J. J. O'Kane, Doon, Ballyconnell, merchant, 10 shares; R. Kells, Doon, Ballyconnell, gentleman, 25 shares; J. Gardiner, Doon, Ballyconnell, C.P.S., 10 shares; J. Drum, Doon, Ballyconnell, spirit dealer, 25 shares; J. McBarron, Doon, Ballyconnell, spirit dealer, 10 shares: J. A. Bennison, Slieve, Russell, Ballyconnell, gentleman, 75 shares; J. A. Foster, Doon, Ballyconnell, merchant, 25 shares; F. J. Clancy, Doon, Ballyconnell, merchant, 10 shares. The first directors are:—Rev. F. McKiernan, F. McGovern, E. Shannon, J. J. O'Kane, R. Kells, J. Gardiner, J. Drum, J. McBarron, J. A. Bennison, J. A. Foster and F. J. Clancy; qualification, £10. Registered office, Ballyconnell, Co. Cavan.

New High-Pressure Gas Light, Chemical and Electric Supply Co., Ltd. (137,868).—This company was registered on October 5th, with a capital of £10,000 in £5 shares, to manufacture and supply gas, for lighting, heating and power purposes, to the towns and districts of Gobowen, Whittington and Ifton Heath, and other places in Shropshire, to carry on the business of a gas and electric company, and that of analytical and research chemists, manufacturers of and dealers in coke, coal tar, pitch, asphaltum, ammoniacal liquor and other residual products, &c. The subscribers are:—B. Rowlson, Gas Offices, Ruthin, North Wales, gas engineer, 5 shares: Mrs. M. E. Rowlson, Gas Works, Ruthin, North Wales, 1 share; W. F. Wilson, 55, Barton Street, Moss Side, Manchester, 5 shares; R. W. Davies, Llwyn Derw, Ruthin, 10 shares; E. Wilson, 55, Barton Street, Moss Side, Manchester, 1 share; F. Turner, 54, Claremont Road, Handsworth, Birmingham, 2 shares; F. I. Rogers, Daisy Bank, Heaton Park, Manchester, representative of gas engineers, 10 shares. Minimum cash subscription, 7 shares. The number of directors is not to be less than three nor more than seven: the first are R. Rowlson, W. F. Wilson, R. W. Davies and F. I. Rogers; qualification, £50; remuneration as fixed by the company. Registered office, Gas Works, Ruthin, North Wales.

Cicoy Magneto Co., Ltd. (137,910).—This company was registered on October 8th, with a capital of £500 in £1 shares, to carry on the business of manufacturers of the whole, or component parts of, magnetos, motor-cars, motor-cycles, cycles, and vehicles of all kinds, electricians, manufacturers of electrical goods, aeroplanes, talking machines, records and accessories, cinematograph theatre proprietors, manufacturers of films and accessories and mechanical and other toy goods, &c. The subscribers (with one share each) are:—S. R. Cohen, 359, Goswell Road, E.C., manufacturer; B. R. Cohen, 359, Goswell Road, E.C., manufacturer: W. Trowell, 88, Cicada Road, S.W., engineer. Private company. The number of directors is not to be less than two or more than five: the first are S. R. Cohen, B. R. Cohen and W. Trowell; qualification, 50 shares. Registered office, 359, Goswell Road, E.C.

Vulcan Electric and Mechanical Co., Ltd. (137,918).—This company was registered on October 8th, with a capital of £1,000 in £1 shares, to carry on the business of agricultural motor tractors, mechanical engineers, manufacturers of malleable iron and steel castings, brass, white metal and aluminium, die casters and founders, &c. The subscribers (with one share each) are:—J. P. Annacker, Springfields, Powys Lane, Palmer's Green, N., engineer; J. Rochford, jun., 24, Village Road, Enfield, fruit grower. Private company. The number of directors is not to be less than two or more than three; the first are J. P. Annacker and J. Rochford, jun., and R. Rochford; J. P. Annacker is permanent, subject to holding 250 shares; qualification of ordinary directors, 25 shares. Solicitors, Hutchison & Cuff, 6, Stone Buildings, Lincoln's Inn, W.C.

British Battery Co., Ltd. (137,905).—This company was registered on October 8th, with a capital of £1,000 in £1 shares (800 preference), to carry on the business of electricians, manufacturers of electric batteries, lamps, filament, novelties, cables, accumulators, wires, &c. The subscribers (with one share each) are:—A. H. Rose, 38-9, Beech Street, E.C., merchant; T. A. Rose, 38-9, Beech Street, E.C., electrical engineer. Private company. The first directors are A. H. Rose and T. A. Rose; qualification, one ordinary share. Registered office, 38-9, Beech Street, Barbican, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Yorkshire Incandescent Electric Lamp Co., Ltd.—Particulars of £6,000 first and £6,000 second mortgage debs., created October 1st, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issues being £300 first and £3,000 second mortgage debs. Property charged: The company's undertaking and property, present and future. No trustees.

London Electric Works Co., Ltd.—Particulars of £5,000 debs., created September 18th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £1,000. Property charged: The company's undertaking and property, present and future. No trustees.

Northwood Electric Light and Power Co., Ltd.—Issue on September 9th, 1914, of £1,000 debentures, part of a series of which particulars have already been filed.

CITY NOTES.

Drake & Gorham, Ltd.

The thirteenth annual general meeting of the shareholders of the above company was held on October 8th, at the offices, 66, Victoria Street, Westminster, Mr. B. M. Drake presiding.

In proposing the adoption of the report (see Elec. Rev., p. 473) the Chairman said that the net profit was somewhat lower than that of last year, although practically the same as the average for the past three years. The difference was caused mainly by additional expenditure under the heading of advertisements which included new catalogues and the circulation of a pamphlet on country house lighting, and partly to a decrease in turnover in the North, due doubtless to the condition of the cotton trade. The whole of the cost of advertisements and preparation of catalogues had been written off, and it was hoped that benefit would accrue after the war. In view of the general financial position it was also thought prudent to make a larger provision than usual for possible bad debts. Although, as might be expected, the number of new installations that were being started for private individuals was not large, there was Government work to be done, some of which they were taking at low prices in order to keep their staff employed. A fair proportion of their employés had answered the country's call to arms, and the directors had made arrangements to provide for their dependents. The firm's system of church lighting continued to find favour, a number of churches having been lit during the year. A sole agency for Lancashire and Cheshire, and a general agency elsewhere, had been arranged for commercial vehicles propelled by Edison accumulators. The use of trucks of this kind was constantly being increased in the United States, and although some headway had been made in England, it took time to persuade the public to adopt anything new. The shortage of horses caused by the war would doubtless tend to increase the use of mechanically-operated vehicles, and as the results obtained became better known and charging facilities were extended, he had little doubt that vehicles propelled by electric batteries would play an important part in the general haulage of this country. A demonstration truck to carry two tons had been purchased for use in the Lancashire and Cheshire district, and they were endeavouring to make known to contractors, railway companies, manufacturers and others, the saving which they could effect by the adoption of electric trucks and delivery vans. With regard to general business, it was difficult to regard the immediate future with any optimism, but, wherever possible, economies would be effected, and no effort would be spared to utilise the company's organisation for any new class of kindred business for which a demand might arise under the altered conditions of the future.

Mr. J. C. Hamilton, M.P., in seconding the resolution, said he was sure the shareholders were glad to know that the company was able to pay a small dividend this year, and that it had not been paid at the expense of those employés who had joined the forces, but that the company had arranged to assist their dependents as far as possible during the continuance of the war.

The report was adopted.

Auckland Electric Tramways Co., Ltd.

The directors' report for the year ended June 30th, 1914, shows that the total revenue for the year was £276,320. The traffic receipts, which amounted to £271,702, show an increase of £14,110 over the previous year. After providing for all expenses chargeable to revenue, including £21,071 for debenture and other interest, the rental and percentage of profits pay-

able to the Auckland City Council, amounting to £5,230, and setting aside £22,500 to the renewals and depreciation account, there is a surplus on the year's working of £51,719, making, with £8,782 brought forward, a total of £60,501. The dividend on preference shares paid and accrued to June 30th, 1914, requires £9,000, and an interim dividend on the ordinary shares for the half-year ended December 31st, 1913, of 7d. per share, free of income-tax, was paid in May last, and amounted to £13,125. The directors now recommend that £10,000 of the available balance be transferred to reserve account, bringing the account to £112,500, and that a further dividend be paid on the ordinary shares of 1s. per share, free of income-tax, for the half-year ended June 30th, 1914, making a total dividend of 1s. 7d. per share for the year. This will require £22,500, and leave £5,876 to be carried forward.

During the year £25,000 first mortgage debenture stock was disposed of, and an issue was made of 100,000 ordinary shares of £1 each. The shares were offered to the existing shareholders at par *pro rata* to their holdings. The whole of the issue was taken up. Under the terms of the debenture stock trust deed, £5,150 first mortgage debenture stock was cancelled, £2,750 of the amount being drawn for redemption at 105 per centum, the balance being purchased in the market at less than that price. The premiums paid in each case have been charged direct to the revenue account. At June 30th, 1914, the issued share and debenture capital of the company was:—£150,000 in 6 per cent. preference shares, £450,000 in ordinary shares, £408,407 in first mortgage debenture stock.

The capital expenditure during the year has aggregated £55,832, the larger portion of which has been applied to the erection and equipment of the new repair works. Expenditure has also been incurred in the provision of additional rolling stock, the duplication of a portion of the lines, the laying of additional feeder cables, and other capital purposes. Ten cars were added to the rolling stock during the year, the number of cars in stock now being 166, which, it is anticipated, will be sufficient to meet the traffic requirements for some time. Twelve of the smaller cars have been coupled, and have proved very useful in dealing with rush traffic when large crowds have had to be handled expeditiously. The traffic receipts were seriously affected by the labour disturbances that took place in New Zealand at the end of last year, resulting in a general strike, when, in consequence of a shortage of fuel, the service had to be suspended for 18 days, from November 8th to 25th inclusive. In addition to the loss of revenue from this cause, the expenses were materially increased after the resumption of the service by the purchase of large quantities of foreign coal at enhanced prices, which was rendered necessary on account of the restricted output from the local mines. The closing of Queen Street during the work of reconstruction of the track and an epidemic among the Maori population in July also had an adverse effect upon the traffic receipts.

The attendances at the Exhibition in Auckland, which was open from December 1st until April 18th, suffered considerably from the effects of the strike, with the result that the extra traffic arising from this source was not so large as had been anticipated. The motor-omnibuses that were acquired by the company at the request of the Exhibition Commissioners to deal especially with the traffic to and from the Exhibition fulfilled their purpose, and the further profitable employment of the vehicles is being considered. The central repair works in the Mount Roskill district have been completed, but, owing to delays due to the labour disturbances referred to, the company was unable to occupy the premises until May of this year. Several extensions of the company's system are in contemplation and are the subject of negotiations.

	1913.	1914.
Miles open—Route miles	25·42	25·42
Passengers carried	40,331,316	44,133,345
Average receipts per passenger ..	1·59d.	1·55d.
,, expenditure per passenger ..	·93d.	1·00d.
Proportion of expenditure to receipts	60 %	65 %
Cars	156	166
Motor-omnibuses	Nil	6

Barbados Electric Supply Corporation, Ltd.—The directors report that the profit on operation for the year ended June 30th, 1914, amounted to £1,381, as compared with £395 for the previous year. This profit has been earned after charging £483 for repairs and maintenance (principally for replacement of poles), as compared with £164 in the previous year. No fees have been paid to the directors, or the members of the Advisory Committee in Barbados, since the issue of the last annual report, although fees for the year have been debited in the profit and loss account. The number of lamps and motors connected, of an equivalent of 25 C.P., was 12,715 at June 30th, 1914, as compared with 9,430 at June 30th, 1913: and the number of consumers was 737, an increase of 281 during the year. The directors consider the progress made during the year, both as regards the number of connections and revenue, as satisfactory. Prospects for the current year were also encouraging until the outbreak of the European war, which has already resulted in a falling off in the number of applications for new connections. It is also expected that the winter tourist season will be affected, with a consequent fall in the supply of current. The negotiations with the tramway company, referred to in the last report, are still pending. Capital expenditure during the year amounts to £1,830, and represents principally extensions to the mains and house connections.

Oriental Telephone and Electric Co., Ltd.—The directors have declared the following interim dividends:—3 per cent. on the 6 per cent. cumulative preference shares for the current year, less income-tax, and 4 per cent. on the ordinary shares, free of income-tax. The warrants will be posted on 31st inst.

Melbourne Electric Supply Co., Ltd.—The directors announce that the gross profit in Australia for the year to August 31st amounted to £104,339, compared with £77,092 for the previous year, an increase of 35 per cent.

Montevideo Telephone Co., Ltd. — The directors state that after providing for all charges in Montevideo and London, the net profit for the year ended July 31st last was £28,525, as against £25,834 for the previous year. The interim dividends paid on May 1st last absorbed £4,343, leaving £24,182, plus £4,464 brought forward from last year, making an available balance of £28,646. After applying £9,500 to depreciation of the company's property and plant, and transferring £9,500 to reserve for renewals, the directors recommend the payment of final dividends of 2½ per cent. upon the preference shares and 3 per cent. upon the ordinary shares, making for the year 5 per cent. on the preference and 6 per cent. on the ordinary shares, leaving £5,303 to be carried forward. The number of new subscribers during the year has again shown a moderate increase.

STOCKS AND SHARES.

Tuesday Evening.

The fall of Antwerp and the subsequent march of the German army upon Ostend served to depress in some degree the various markets of the Stock Exchange, having the effect more of checking buyers than of inducing sales. Had the House been open, no doubt considerable excitement and no little depression would have ensued; but, in the street, business simply came to a standstill, and members agreed amongst themselves that, had the enemy wished, they could probably have taken Antwerp several weeks before, so that the event, regrettable as it was from every standpoint, could scarcely have been deemed improbable.

The price of Consols remained at the officially-fixed figure of 68½; and the only quotable effect was felt in such shares as Canadian Pacifics, a few Home Railway stocks and in mining shares, while in other departments the tone took on a dull appearance. Business, therefore, is smaller again; and the revival of interest in stocks and shares to which allusion was made here in the succeeding two weeks has been damped for the time being, investor and speculator alike waiting for some better news before entering upon fresh engagements.

The feature of the week, so far, is the success which attended the issue by the London and South-Western Railway of £1,000,000 5 per cent. redeemable preference stock, offered at 99¾, the money being required mainly for the electrification work now proceeding on the railway. There was a rush for the stock; and upon its being understood that the issue would probably be allotted almost entirely to proprietors of existing securities of the company, literally hundreds of would-be buyers offered a premium of 1 per cent. or so, without finding sellers.

The stock, which, at its issue price, is a trustee security, must be considered cheap; and some of the dealers in similar stocks expressed the hope that other companies would not take it as a precedent, because, if they followed suit by offering trustee stocks on a 5 per cent. basis, this would have a marked effect upon gilt-edged securities of all kinds. As the stock is redeemable at 100 in 10 years' time, or at the same price five years hence at the option of the company, it can scarcely be said to compete directly with the present preference issues of other leading Home Railway lines. But the distinction is more apparent than real, and the sympathetic effect upon those other stocks cannot fail to be considerable.

The occupation of Brussels by the enemy, the surrender of Antwerp, and the threatening of Ostend served to remind the Stock Exchange very vividly that some of its best clients will be unhappily out of the markets for a long time to come. The Belgians had a liking almost akin to a passion for tramways and tramways shares. Brussels held large lines of Brazil Tractions, Antwerp was a lively centre for dealings in South American tramways shares, and issues of several English tramway companies were popular with investors spread all over Belgium.

It used to be axiomatic that any tramway scheme, from whatever part of the world it might emanate, would be assured of careful attention in Brussels, and two or three of the other leading Belgian cities. All this, it is only too sorrowfully to be feared, must be regarded as a thing of the past; though it may be as devoutly hoped that, when the indemnity question comes to be settled, whatever investments of the thrifty Belgians have been lost or destroyed in the course of the war will be paid for on that same lordly scale which the German marauders demand from the cities that they "conquer."

In the Electric Railway market, the 1s. shares of the Underground Railway Company have crept up to 6s., and the Income bonds, which were offered the other day at 79½, have recovered to 81—which, by the way, is no worse than the price stood when the war broke out. The London General Omnibus Company has just received fresh orders for another large consignment of 'buses to be sent to the Continent; and the denuded fleet in London is permitted to overcrowd its remaining vehicles in a manner which is, no doubt, as profitable to the Company as it is uncomfortable to its customers. This consideration has not yet affected the price of District Ordinary stock, which remains about 19½, while Metropolitans continue at 32. In the Central London Preference group no changes have occurred.

It may be well supposed that the drastic regulations of the police with regard to London lighting have not done the market for supply issues any particular good. Some discussion has arisen as to what is likely to be the effect upon the principal companies if this order should remain in force for some months, because,

obviously, the amount of current being taken for lighting purposes is very materially reduced, so far as the necessities of streets and shop-fronts are concerned.

Prices of Electric Supply issues are, therefore, stationary. County of London Preference shares are offered at 11⅛, City of London Preference at 12¾, at which prices the yield is £5 1s., and £4 14s. respectively. There is a scrap of County 4½ per cent. Second Debenture stock on offer at 100, which looks cheap considering the nature of the security at the back of it. Urban 4½ per cent. Debenture stock can be bought to pay nearly 5¼ per cent. on the money; and there is an odd lot of Metropolitan 3½ per cent. Debenture stock at 82, which gives 4¼ per cent. One of the tempting stocks to be picked up just now is the 5 per cent. Debenture of the Adelaide Electric Supply Company, which a buyer can get for 102¼, free of stamp and fee, with dividends due on June 1st and December 1st. There was a rush for the stock when it came out; and the subscription lists, it may be recalled, were open for an hour or two only.

There is more going on in the shares of the companies connected with electrical manufactures and lamp-making. The war has forced German business into this country, and one hears that most of the manufacturing concerns are working to something like the utmost limit of their capacity. Edison & Swan fully-paid shares are 30s., and the partly-paid 4s. 6d., the latter being three times the price at which they stood when the war broke out. British Westinghouse Preference stock at 30s. are very firm. The company's 4 per cent. Debenture changed hands the other day at 74, at which the return is £5 8s. 1d. on the money; and the 6 per cent. Prior Liens are 98½. Electric Construction shares are 11s., Crompton 5s., and the Preference 9s. General Electric Ordinary at 11½, and the Preference at 9¾ are steady.

Amongst Telegraph and Telephone shares the tone is a little heavy, this being due mostly to sympathy with other investment sections. Prices are a shade weaker than those quoted in our last issue. Marconis eased off 1/8 to 35s., while the subsidiaries have also given way a few pence.

Armament shares of various kinds are fairly active, and private advices from Sheffield tell us that the market there is comparatively animated. B.S.A. shares, for instance, at 55s. 6d. are nearly 15s. higher than they were when the war started, although Vickers at 35s. and Armstrongs at 39s. 6d. have not greatly changed. The companies' pre-ordinary classes, however, are decidedly good; and each evidence of the probable prolongation of the struggle serves to quicken the interest of the buyers. The Rubber share market, on the other hand, keeps quiet; and although prices do not come down, business in the shares is somewhat stagnant. One of the largest of the insurance companies, by the way, has recently laid down a rubber staircase and rubber floors, in consequence of a nasty accident which occurred through an official slipping on the previous staircase and damaging himself severely.

The Rio Tinto Company—greatest of the Copper group, from the London point of view—has just passed its interim dividend, for the first time in many years; and other companies concerned with baser metals are none too popular with their usual supporters. We understand that negotiations are on foot for the formation of a large company, with several million pounds capital, for the purpose of dealing in England with the smelting work which has hitherto been almost confined to Germany. The sponsors of this scheme hope to receive Government support, either in the shape of capital itself, or else by way of a guarantee of dividends upon the money; and preliminary efforts are being made with a view to securing official assistance.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Month ended (4 wks.)	Receipts for the month.		No. of weeks.	Total to date.		Route miles open.	Inc.
		£	£		£	£		
Bath	Sept. 20	4,095	— 548	39	89,078	+ 467	..	..
Blackpool-Fleetw'd	Oct. 10	3,382	—1,058	40	85,281	— 4,874	8	..
Bristol	„ 2	34,490	— 411	40	342,002	+19,859	30·5	..
*Brit. Elec. Trac. Co.	Sept. 18	164,610	+4,613	..	..	..	429·8	..
Chatham and Dist.	Oct. 1	4,897	+ 249	37	87,484	+ 716	14·98	..
Cork	„ 1	2,041	— 106	39	19,662	+ 17	9·89	..
Dublin	„ 2	23,422	+10,047	40	2:2,528	+ 8,867	54·25	..
Hastings	Sept. 30	4,887	—1,083	..	..	— 2,536	19·3	..
Lancashire United	„ 30	6,551	— 436	39	64,965	+ 4,438	42	..
Llandudno-Col. Bay	Oct. 2	1,451	— 410	44	14,239	— 1,977	6·5	..
†London United	Sept. 18	11,821	—1,644	38	236,808	— 2,559	..	..
Tyneside	„ 20	2,981	+ 874	14	8,816	+ 1,340	11	..
Anglo-Argentine	„ 30	203,141	—14,998	40	2,118,544	—37,176	..	..
Auckland	„ 25	20,993	+1 050	13	68,950	+ 3 7:7	25·42	1·01
Brisbane	August	33,172	+3,902	31	231,227	+24,649	..	..
Calcutta	Oct. 10	16,961	—3,371	..	..	— 4,851	20·5	..
Kalgoorlie, W.A.	July	2,552	..	31	18,074	..	..	..
Madras	Sept. 30	3,441	— 158	39	84,483	+ 2,204	15·25	..
Montevideo	Sept.	25,2·7	—2,643	47	334,965	— 9,336	..	..
Cen. London Rly.	..	..	..	..	..	..	..	..
City & S. Lon. Rly.	..	..	..	..	..	..	..	..
Dublin-Lucan Rly.	Oct. 2	691	+ 66	13½	2,218	— 93	7	..
L'pool Overh'd Rly.	..	..	..	..	..	..	..	..
London Elec. Ry. Co.	..	..	..	..	..	..	..	..
Mersey Railway	..	..	..	..	..	..	..	..
Metropolitan Rly.	..	..	..	..	..	..	..	..
Met. District Rly.	..	..	..	..	..	..	..	..

* Three weeks. † Two weeks.

MARKET QUOTATIONS.

Owing to the war, the prices given below are, of course, more or less nominal.

Wednesday, October 14th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	Nom.	..
a „ Nitric	„	„	..
a „ Oxalic	per lb.	8d.	..
a „ Sulphuric	per cwt.	Nom.	..
a Ammoniac Sal	„	„	..
a Ammonia, Muriate (large crystal)	per ton	£49	..
a Bleaching powder	„	Nom.	..
a Bisulphide of Carbon	„	„	..
a Borax	„	£18 10	..
a Copper Sulphate	„	£22	..
a Lead, Nitrate	„	£32	..
a „ White Sugar	„	Nom.	..
a „ Peroxide	„	„	..
c Methylated Spirit	per gal.	„	..
a Potassium, Bichromate, in casks	per lb.	7d.	..
a Potash, Caustic (88/90 %)	per ton	Nom.	..
a „ Chlorate	per lb.	7½d.	..
a „ Perchlorate	„	5½d.	..
a Potassium, Cyanide (98/100 %) (for mining purposes only)	„	Nom.	..
a Shellac	per cwt.	70/-	..
z Sulphate of Magnesia	per ton	Nom.	..
a Sulphur, Sublimed Flowers	„	£8 10	..
a „ Recovered	„	Nom.	..
a „ Lump	„	£7 10	..
a Soda, Caustic (white 70/73 %)	„	Nom.	..
a „ Chlorate	per lb.	„	..
a „ Crystals	per ton	„	..
a Sodium Bichromate, casks	per lb.	3½d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£88	..
b „ Wire, in ton lots (1 to 14 S.W.G.)	„	£112	..
b „ Sheet, in ton lots	„	£112	..
p Babbitt's metal ingots	„	£50 to £221	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7¾d.	..
c „ Tube (brazed)	„	9¾d.	..
c „ „ (solid drawn)	„	8¾d.	½d. dec.
c „ Wire, basis	„	7¾d.	½d. dec.
c Copper Tubes (brazed)	„	9½d.	..
c „ „ (solid drawn)	„	9½d.	..
g „ „ Bars (best selected)	per ton	£72	..
g „ Sheet	„	£72	..
g „ Rod	„	£72	..
d „ (Electrolytic) Bars	„	£56	..
d „ „ Sheets	„	£74	..
d „ „ Rods	„	£62	..
d „ „ H.C. Wire	per lb.	7¾d.	..
f Ebonite Rod	„	3/6	..
f „ Sheet	„	3/-	..
n German Silver Wire	„	1 7	..
h Gutta-percha, fine	„	6/10	..
h India-rubber, Para fine	„	2/9½	..
l Iron Pig (Cleveland warrants)	per ton	49/3	2/8½ dec.
l „ Wire, galv. No. 8, P.O. qual.	„	£16	..
g Lead, English Pig	„	£18 10	..
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£10	£3 inc.
e Mica (in original cases) small	per lb.	4d. to 2/6	..
e „ „ „ medium	„	3/- to 5/-	..
e „ „ „ large	„	6/6 to 10/6 & up.	..
o Nickel, sheet, wire, &c.	„	Nom.	..
p Phosphor Bronze, plain castings	„	1/1 to 1/3½	..
p „ „ rolled bars & rods	„	1/3½ to 1/8	..
p „ „ rolled strip & sheet	„	1/3½ to 1/5½	..
o Platinum	per oz.	185/-	..
d Silicium Bronze Wire	per lb.	10½d.	..
r Steel, Magnet, in bars	per ton	£141	..
g Tin, Block (English)	„	£128	..
n „ Wire, Nos. 1 to 16	per lb.	2/3	..
p White Anti-friction Metals	per ton	£44 to £194	..
k Zinc, Sh't (Vieille Montagne bnd.)	„	Nom.	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Russia.—The Allmänna Svenska Elektriska A.B. (Asea) has, as previously stated, formed a subsidiary company in Norway and one in Finland. It is now reported from Stockholm that it has formed a company at Petrograd for the purpose of erecting a manufactory of electrical goods in Russia. The name of this company is the Ryska Elektriska A B. Asea, and the capital is 600,000 roubles, the majority of the shares being in the hands of the Swedish company. At the present time the conditions are not such that people will be over anxious to invest a large amount of capital in new factories, and the building of such may thus be postponed for a time; but the Russian market is already such a big consumer of electrical goods, that there may be sufficient inducement to go on with the work, especially now, when it seems as if the German manufacturers will be almost entirely excluded from doing business in Russia.

Indo-European Telegraph Co., Ltd.—An interim dividend for the half-year ended June 30th last at the rate of 5 per cent. per annum, free of tax, has been declared.

EARTH CONNECTIONS.

By Francis H. Davies.

It is often a matter of some difficulty to secure a permanently good connection with earth, and to this end many special devices and methods have been employed, particularly in America where, owing to the prevalence of extra high-tension generating and distributing systems, the need has been specially felt. In this sphere of work it is usual to connect to earth the frames of all generating, transforming and high-tension switching apparatus, also the metal framework of switchboards, instrument cases and the secondaries of instrument transformers, lightning arresters, etc. The majority of such earth connections are liable to have to carry comparatively large currents, and it is therefore essential that they should be of permanently low resistance and ample in area. While the fulfilment of the latter requirement should in most cases be a simple matter the former is not always so, and the difficulty often experienced has led to the introduction of numerous devices, some of which are good and many worthless. The oldest and the one still mostly in use consists of burying in a hole some 6 ft. or 8ft. square, a tinned copper plate of about No. 16 gauge. The depth should be sufficient to ensure contact with permanently damp earth, and the plate should be surrounded with two feet or so of granulated charcoal or carbon such as old arc lamp electrodes. Coke and cinders are often used, but their employment is inadvisable as, being rich in sulphur, they have a corroding effect upon the plate. A heavy wire is soldered and riveted to the plate right across its surface in order to secure a good area of contact, and the hole is filled in with earth kept moist as the work proceeds with running water. As it is so essential that the earth surrounding the plate should be permanently damp, it is best, if possible, to carry out such work after a dry season, as if damp earth is found at such a period there can be little doubt of that condition being permanent. This point is probably often overlooked, with the result that many earth connections which are efficient in winter seasons are almost if not entirely useless in summer. It is quite possible to make an excellent job of such a ground connection if the work is well done and the soil suitable; but if the latter is dry or composed of gravel, sand or clay, instead of rich moist earth, the method is not dependable, and it is necessary to keep the area thoroughly damp by means of water supplied close to the plate through a pipe. All methods of earthing dependent upon a buried electrode are alike in this respect, though the important auxiliary of a water supply is often ignored. A disadvantage of the earth plate as above applied is its cost, which it must be remembered lies greatly in the excavation of a fair sized hole. Where only one plate is required this is perhaps not a matter of moment, but in many large distributing systems the number of earths installed is considerable, and the total cost may well run into a good sum. To meet this important objection several devices have been placed on the market, one of these being shown in fig. 1. This consists of a perforated copper cone fitted with a suitable head and point connected together by a central rod and filled with pulverised carbon. For an equal area of earth contact the hole required is much smaller than with the plate, whether the latter is placed vertically or horizontally. One of the claims put forward for this cone is that in consequence of the capillary action of the charcoal in absorbing moisture the earth around it is always damp. Whether this claim can be substantiated in every instance remains to be proved, but in any case the cone is convenient to handle and should be cheap to instal. It should be bedded in granulated carbon in the same manner as the ordinary earth plate.

An American device which depends for its efficiency upon the same principle of the absorption of moisture is shown in fig. 2. A central conducting rod, insulated at the upper end, carries four ovoid-shaped discs, each 6 in. in diameter. These are made of a porous substance which readily absorbs moisture, and it is claimed that the area of efficient contact with the earth is therefore large. The upper

Fig. 1.

Fig. 2.

end of the stem is threaded, and may consequently be extended to any length by means of suitable rods. In the two sizes manufactured the over-all lengths are respectively 19½in. and 6ft. 2in., the corresponding lengths of the stems being 6in. and 5ft. 7½in. This device should be set at a good depth varying with the nature of the soil, and before placing it in the hole the surrounding earth should be well saturated with a saline solution.

Another American device is illustrated in fig. 3. Three copper bowls are fastened to a central rod, and each bowl is filled with pulverised carbon, which is kept in place by a metallic screen. The object of the bowls is to entrap rain-water as it filters through the ground, and so long as the surrounding earth is moist the water will remain in the bowls. In dry seasons the presence of water tends to keep the neighbouring soil moist, and it is claimed that the water in the bowls is sufficient to maintain this condition for a considerable time. The device gives a good area of contact and does not require a large hole. It is so designed as to allow the earth to be tamped firmly around it without becoming distorted.

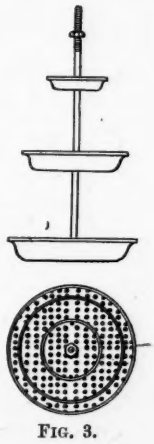


Fig. 3.

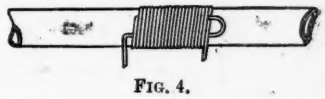


Fig. 4.

Fig. 5.

Connection is made at the top by means of a slot in the rod running parallel with its length. The wire is inserted in this, and the screwing down of the nut clamps it tight ready for soldering if required.

Under most circumstances a water main makes an excellent earth, but if there is any liability of a heavy current flowing, only large main pipes should be used, as small branches have a very appreciable resistance. The connection should be made as close as possible to the point of entry of the pipe into the ground if in a building, and on the earth side of all water

meters, valves or other appliances. The best way to secure efficient contact with a large iron pipe is to drill and tap a ½-in. hole in the socket or flange, fitting this with a special brass or copper lug in which the earth cable is sweated. If this method is not feasible or access cannot be obtained to a flange or socket, the wire can be efficiently connected to the barrel of the pipe in the manner shown in fig. 4. The earth wire is run along the pipe parallel to its length for a few inches; it is then doubled back on itself, and finally twisted round the pipe in a close helix. The last turn is threaded through the loop as shown, and the other end of the wire is pulled in such a manner as to bring the loop hard up against the free end of the wire. This gives a good conducting area, a firm grip, and prevents the coil from unwinding. The pipe is first cleaned and tinned, and after the wire is wound on, the whole is soldered up solid. If soldering is considered unnecessary or cannot conveniently be effected, a substitute may be found in wrapping the joint with a couple of layers of tinfoil and covering the whole with several layers of adhesive tape to keep out moisture. Connection to pipes of small diameter is best obtained by means of special clips of which numbers have been devised. As they give an ample area of contact and are quickly and easily installed, they are to be preferred to the wire-wound and soldered joint which, as usually constructed, seldom has sufficient contact area to carry a current of any size. The result is often overheating and burning of the pipe at the connection, especially if it is of lead.

Under favourable conditions a good earth may be obtained by driving one or more 1½in. or 2in. galvanised iron pipes into the ground to a depth of 6ft. or 12ft., according to the nature of the soil. Such pipes should be pointed at the bottom and drilled at the lower end with a number of ¼-in. holes. When driven, a saturated salt solution should be poured into the pipe, and this, finding its way out at the holes, impregnates the surrounding soil and lowers its resistance. The result of a large number of tests carried out in various localities tends to show that such impregnation of the soil may be depended upon to lower the resistance of the "earth" by 50 per cent. or more, and on the pipe system it is a very simple matter to keep the connection up to the mark by periodically filling up with brine, although it is found that this is only required at infrequent intervals. It is possible still further to improve the pipe type of earth in this respect by employing the arrangement shown in fig. 5 or some modification of it. Here, a common drain pipe is placed round the head of the pipe and filled with rock salt and water which gradually impregnates the soil all round and to a considerable depth, thus materially improving the conductivity. It is sufficient to pack the head of the pipe with salt and fill round with earth, but the drain pipe makes a better job and is more convenient when replenishing. It is clearly a very simple matter to make a good connection to a pipe earth by means of a suitable lug screwed into the head, and as no excavation is required and the pipe itself is cheap, it is by far the least expensive type. In the absence of screwing tackle or suitable nuts, a good connection to a pipe may be made by plugging the pipe at a depth of 8in. or so from the top and pouring in molten white metal around a heavy gauge iron wire placed centrally in the pipe. This method, however, possesses the disadvantage of permanently closing the end of the pipe, thus rendering the periodical treating of the soil with a salt solution impossible without withdrawing the plug. It should be remembered that in driving such a pipe the blows set up vibration along its length, and this tends to press the soil away from the pipe and cause bad contact, and consequently high resistance. The remedy is effectual tamping of the ground, and this will be found to increase the conductivity very materially, especially in loose soils.

In a paper read before the International Association of Municipal Electricians in America some twelve months back, Mr. H. P. Liversidge describes a modified form of pipe ground which he states possesses many advantages. Strictly speaking, this apparatus belongs to the more elaborate types described at the outset of this article as will be seen from fig. 6. The galvanised iron pipe is fitted at the lower end with a circular iron frame 5in. in diameter and 12in. long, which has a number of ribs projecting radially outwards. This frame is filled with a special hygroscopic substance held in position by a galvanised iron screen, and the total contact area is about 500 square inches. As before explained, the presence of the hygroscopic material

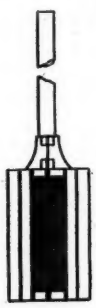


Fig. 6.

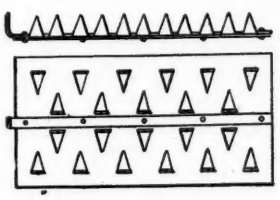


Fig. 7.

ensures moisture in the neighbouring soil, and it is stated that with this type of earth it is not necessary to provide extraneous moisture or salt solutions.

A deviation in the design of an ordinary earth plate is shown in fig. 7. This type of plate has for some time been employed by the London County Council in connection with the earthing of lightning conductors. It is of No. 16 gauge copper, measuring 3ft. by 1ft. 6in., and until recently two such plates were installed with each conductor. It is now customary to use only one plate, 3ft. square. It will be noted that a number of triangular tongues are cut out of the plate and bent upward at right angles, and the function of these is to facilitate discharge. The plate is laid flat in the hole with the tongues uppermost, and is surrounded with wood-charcoal well rammed. Connection is obtained by means of a copper strap riveted and soldered across the whole surface as shown, and this joint is protected by a thick coating of tar.

The importance of the subject of earth connection has caused a considerable number of experiments to be made, and the result of these points clearly to the following facts. The area of contact with the soil must be sufficient to preclude any possibility of heating under the largest current that is likely to flow for an appreciable period. If heating occurs, the moisture in the soil, which is so absolutely essential, is evaporated, and the "earth" becomes ineffectual. It is impossible to give any definite figure of maximum allowable current density, as everything depends upon the intimacy of contact and the nature of the soil. Average results even are unreliable, and it seems that each case, if important enough, must be studied individually and experimented with. It appears certain that good top soil yields the least resistance, clay the highest, and gravel intermediate. It is often thought that immersing an earth connection in a stream, leaving the plate lying on the bottom is an effectual method, but this is usually far from being the case, as the resistance of moderately pure water is high. A stagnant pond or very impure stream will give better results, as it is well known that owing to the organic matter held in suspension the resistance is comparatively low. On the other hand, a pipe driven into the bed of a stream or a plate buried in that position will make a good

low-resistance earth, for it is in actual and intimate contact with permanently wet soil. Finally, it is well to remember that where possible risk to life or damage to expensive plant is concerned a single earth connection should not be depended upon. The safest system under such circumstances is to install several plates or rods, if possible, some distance apart, in order to secure whatever advantage there may be in varying wetness of the soil. These should be efficiently connected together by a cable thoroughly protected from damage, and to this end it is usual to lay it in an iron pipe. It must not be forgotten, however, that where alternating current is concerned such an arrangement is highly inductive, and in the event of a considerable current flowing the installation might be rendered practically ineffectual. The way out of the difficulty is to connect both ends of the pipe to the conductor, thus making the former part of the circuit.

CO-OPERATION IN TRADE EXPANSION.

By C. ASHMORE BAKER.

The generous and helpful offer made to the British electrical industry by the Editors of the Electrical Review in the issue of September 25th (pp. 418-419) deserves a quick and ready response.

The Review has throughout its history been a sturdy champion of "organisation," and we have to thank its editors for the existence of more than one healthy and virile sodality.

In the present case a wide field and a propitious hour should assist largely in adding another battalion to the fighting line of British trade. I submit, however, that in order to focus the attention of the British trader something more definite is required than even the magic word "co-operation."

Thus the mind is vexed with gloomy doubts whether the average manufacturer in this country knows what co-operation means.

He might discover some useful facts about it if he would consult his "hands," especially where he has works in the North Country. In some parts of the world enlightened manufacturers make a practice of seeking information from their employees. The British manufacturer, however —— (passage excised by Censor).

Banter aside, let us glance at some of the conditions which are essential to successful co-operation; and I think the first of these conditions is that the area of membership of the movement should be as wide as possible.

Thus, an association of certain firms not mutually competitive organised for the combined selling of their goods would not fill the bill. Such an organisation might form a highly successful factoring enterprise, but inasmuch as the number of firms associated in it must necessarily be limited to one or two manufacturers in each line of produce dealt with, it could not include all the firms occupied with a given industry, and the remaining houses must of necessity be left out in the cold. Membership must therefore be open to any reputable firm willing to subscribe to the articles of association, from which follows the corollary that membership should not necessarily be confined to any particular industry, which is all to the good since we thus have practically the whole trade of the country to draw upon for support.

A second essential condition is that the amount of benefit to be derived from membership of the association should be as nearly as possible proportional to the amount of business done between the member and the association. This is the basic principle underlying co-operation as now understood, and it involves the further corollary that the capital of the association must be limited both as to the maximum amount which any member should be permitted to hold and as to the maximum percentage of interest payable thereon.

The rigid application of this principle will prevent the association from becoming a sort of super-middleman owned, possibly, by persons outside the manufacturing interest altogether.

Now, as to the fields of activity in which such an association can be of use.

Obviously we must limit its functions as much as possible to those which are unlikely to be the cause of jealousy and dissension among the members or of real or suspected partiality on the part of the officials, and for this reason I doubt if the direct selling of goods co-operatively would be feasible, at least, as an immediate and general object.

Apart from direct selling, however, there are wide areas on which the members could meet on level terms without any great risk of collision between rival interests.

To begin with there is cataloguing.

One of the chief causes of complaint by foreigners against the British merchant is that he will not mark his goods in plain figures. The British esotera of feet and inches added to the kebalism of £ s. d. clothe our commerce to the Slav or Latin eye with a mystic veil and tend to exalt the art of dealing with England into the realm of the occult.

We must try and envisage the viewpoint of our customers in this respect. Consider for a moment! Should we ourselves trade more freely with a nation which persisted in expressing prices and discounts in the forms and symbols of the calculus?

Our failure in the past in this matter has not been entirely the result of stupidity; rather, it results from the structure of our system of production.

Our principal rivals have organised their production in big concerns, and the big concern, although not by any means the most efficient in all ways, possesses the advantage of being able to set up in most cases its own translation bureau, a weapon which, impossible to the smaller manufacturer working by himself, becomes cheaply available to the smallest under co-operative conditions.

Here, at least, we have a jumping-off place for co-operative development.

Let us establish a bureau for translating, printing, and generally "getting up" catalogues suitable for the countries in which they are to be circulated. Let the prices charged for the work be in the first instance comparable with those demanded in the general market for such work, and let orders be accepted from all and sundry, but let the profits be distributed among the members only, and in the form of a percentage dividend on the business done with each.

Hence the institution, while being in a position to benefit by all the orders it could book, would be protected against any accusation of cutting prices against the regular market, while members of the association would in effect get their work done at cost price or even less if the amount of work done for non-members were to form a large percentage of the whole.

A further advantage to be gained from the establishment of such a bureau would be the standardisation of and flexibility in the style of the work done—a very valuable characteristic in the eyes of the buyer.

Another promising field of action would be the gathering of information as to the demands and conditions of trade in foreign countries. This is again a matter in which the foreign type of big business has hitherto had the advantage over British individualism; which advantage can be annulled, and more than annulled, by co-operative action. The firm of moderate resources cannot afford to send expensive investigators into every market. An

association of traders, on the other hand, would carry out this work at a comparatively moderate cost per firm, and enormous benefit would result from the knowledge thus gained of the markets for which the British producer proposes to cater.

A further direction in which individual firms might co-operate without treading on each other's corns would be the establishment of local machinery in various countries for the collection of accounts.

Short credit is one of the drawbacks to trade with Britain, and this drawback might well be lightened by some such scheme as I suggest.

This brings me to the subject of industrial banks.

German trade in particular has been greatly fostered by the German bankers' credit system, which has rendered possible the long credit which buyers in most countries usually demand (depending as they do on harvests, etc.), while at the same time it has relieved the manufacturer of the necessity for tying up money urgently needed for immediate use. Thus the buyer gets the long credit which is absolutely essential to him; the producer gets the quick return which is also his lifeblood, although those returns may be relatively small; while the banker gets the lion's share of the profit, which is what he is out for. But make the bank a co-operative concern and the big profits which must go in the first case to the bank in any event will revert ultimately to the producer in the form of dividends on the banking business done with him by the bank. In other words, he gets his credit at cost price and no outsider gets a rake-off from this particular transaction.

Now as to transport. I fear it will be some decades before the nation decides to take over the railways and thus eventually relieve its trade of the tax of thirty or forty million sterling now levied by the railway shareholders.

But there is much virtue in co-operative shipping. Freight rates are now largely dictated by the powers that rule the big lines. These big lines are steadily acquiring wider and wider powers, and as steadily concentrating those powers in fewer and fewer hands. What is to prevent this process from being carried to its logical conclusion of the establishment of a single shipping interest able to exact such a toll from over-seas trade as to make that trade barely worth doing and nothing more?

Against such a contingency there is only one safeguard for the still independent British trader, and that is a Co-operative Mercantile Fleet. A big thing? Of course it is.

British trade is a big thing, and it is going to be bigger if we set about making it so in the right way. And why should we be afraid of size if the quality is sound?

I have outlined an ambitious programme, and yet it does not cover the ground to which co-operative trading might be applied. Thus I have said nothing about insurance or the production and import of foreign grown raw material. And yet bold though the programme may seem, it is no wild-cat scheme. A similar organisation is already in being.

Even the more important items, such as shipping, insurance, the production abroad and import to this country of over-seas produce are now being carried out successfully on co-operative lines.

And by whom? By the working man. The very employee of the manufacturer, the "captain of industry" whose energy, initiative and resource are set before us as the justification for his very existence.

If his energy, initiative and resource are not sufficient to enable the "captain of industry" to help himself, even by the path already discovered and proven by his employee, then it is time he took his place in the "great limbo of vanities" along with the

"Embrios and idiots, eremites and friars."

What I hope will be realised is that the principle of co-operation will give to the individualistic British trader the advantages to be derived from the trust or the combine without the compulsion and waste which those systems involve.

This article, although necessarily containing nothing more than suggestions framed in vague and general terms may, it is to be hoped, act as a stimulus to some of those who realise the duties and possibilities arising out of the present upheaval.

ADVENTURES OF A G.E.C. MAN AT THE FRONT.

Mr. W. Niblett, of the General Electric Co., and lately with the General Electric Co. (of Belgium), Ltd., a sub-company of the General Electric Co., Ltd., residing at Berchan, St. Agathe, a suburb of Brussels, has sent home a thrilling description of a journey to Namur undertaken only two days before the occupation of the Belgian capital by the Germans.

"The enemy's aeroplanes had all day been hovering over St. Agathe," he writes. "The following morning, long before dawn, I was aroused by a uniformed messenger, who informed me that my services as an electrician had been requisitioned by the War Department. A motor car was waiting, and soon we were speeding along to Namur, 90 miles distant, at 50 miles an hour. Those two hours were crammed with adventures.

Motor-Car Breakdown.

"The Belgian roads are unsuited for heavy traffic, and the constant passage of artillery and transport wagons, laden to the brim with fodder and ammunition for the troops, had cut them about terribly. We carried two spare wheels, and we were compelled to avail ourselves of their aid long before we had completed half the journey. A German had been trapped red-handed in the act of liberating pigeons, and, face to the wall, in the first grey streaks of dawn, he had to pay the penalty of his life. It was the first occasion for me to witness the shooting of a man in cold blood, but I have since gone through so much that such incidents appear trifles.

A Tearful Request.

"We met with a serious accident to the car fifteen kilometres from our destination, and after vainly tinkering with the defective machinery, the chauffeur and I decided to tramp it, leaving the disabled car on the roadside. As we passed a little cottage, an old woman, learning that we were going to Namur, where her son was on duty in the trenches, begged us to take him a parcel. I had not the heart to refuse her tearful request, and taking the little bundle trudged wearily on. If I had know what part it was destined to play in the day's chapter of accidents, I might have hesitated to perform what seemed at first sight so simple a service. Soon we were overtaken by a car containing four officers dressed in Belgian uniform. I hailed them, and after they had listened to our story, and scrutinised our credentials, they told us to jump in. They were wonderfully good-natured fellows, I thought. We quickly made friends, and I had soon told them all I knew about the movement of the troops and the preparations to offer resistance at Namur to the German invaders.

Adventures with German Spies.

"We were travelling at a high speed along the straight road that enters Namur from the direction of Brussels, when we espied an armed patrol of the Civic Guard, who signalled us to stop. To the amazement of my companion and myself the officer at the wheel opened out the engines to full speed, and we darted forward like an arrow.

"The Guard presented their guns and we ducked. They fired at us and shot the driver through the head, killing him instantly.

"I was seated next to him on the off-side of the car, and acting under a sudden inspiration I shut off the power and pulled back the lever applying the brakes. Had I not had presence of mind to do so we would all have met with certain death, for the car, going at a terrific speed, was oscillating wildly from one side of the road to the other. As it was the catastrophe was averted, and the guard arrested us instead. We were asked to produce our passports. The officers had none, they refused to answer questions, and remained taciturn and dour. They were German spies, masquerading in the uniform of our army. It is an every-day occurrence to find the enemy conducting their warfare with an utter disregard of 'Queensberry Rules,' and an every-day remedy was applied—they were shot before our eyes.

Objects of Suspicion.

"The candour and passports of my companion and myself I thought had entirely diverted suspicion from ourselves, but being found in such company had compromised us. Besides, I still had the parcel of the old peasant woman. With due pomp and ceremony it was opened in the presence of the Commanding Officer and the Guard who arrested us. Our lives depended upon its contents. It was undone, and found to contain cakes. How we laughed! We were released, passports were inspected at least a dozen times, and we at last arrived at the Forts.

"All day long and far into the night I worked at installing fans in the entrenchments, laying field telephones, and electrifying the barbed wire defences. When my task was over the chauffeur and I got another car and made for Brussels. We reached there only to be arrested again. We established our identity and were set free. Next day I went to the War Minister and complained about my frequent arrests, so he clothed me in the Belgian uniform, and provided me with a gun. So here I am for better or for worse."

Mr. Niblett's wife (a Cardiff lady) and their two children are with him.

THE BRITISH ASSOCIATION IN AUSTRALIA.

[by our special correspondent.]

The visiting members of the British Association for the Advancement of Science arrived in Sydney on Thursday morning, August 13th, by three special trains from Melbourne. No formal business was arranged for the afternoon, but in the evening Prof. W. H. Bateson delivered his presidential address at the Town Hall. The various sections met at the Sydney University at 10 o'clock on Friday morning. In the Engineering Section, which met in the new Lecture Room in the Engineering School, Prof. E. G. Coker delivered his presidential address, dealing particularly with the subject of stress distribution in materials, and describing an interesting method of obtaining a graphic illustration of the stresses by observing the refractive properties of a celluloid model. Prof. Coker pointed out that mechanical measurements could not completely satisfy all our modern requirements, since they were essentially average values. He referred to the thermal methods of investigation, and mentioned that Mr. Howgrave Graham and he had examined a number of rolled metals under stress up to breaking point under Röntgen rays without, however, discovering any change in the appearance of the material as seen on the fluorescent screen. The discovery by Sir David Brewster, almost exactly one hundred years ago, of the doubly refractive properties of transparent bodies under stress was then mentioned, also Brewster's suggestion that models of arches might be made of glass and the effect of stresses due to loading rendered visible in polarised light. The difficulties attached to the use of glass were pointed out, and the solution of the problem by the use of nitro-cellulose compounds, which have optical properties very little inferior to glass, are able to bear great stresses without injury, and also are capable of being fashioned with the ease and certainty of a wooden model. Photographic processes are also able to reproduce the brilliant colour effects caused by stress in transparent materials, so that permanent records can now be made for future reference. A number of slides were shown of records of the stress distribution with a wheel on a rail, riveted plates, toothed wheels, compound springs, etc., the resulting stresses showing in a clearly defined manner. Some sixty members were present, and at the termination of the paper a vote of thanks was moved by Judge Backhouse, Vice-Chancellor of the Sydney University, and seconded by Prof. Warren, Professor of Engineering, Sydney University. Mr. L. A. B. Wade followed with a paper descriptive of the main irrigation system in New South Wales, describing in some detail the construction of the dam at Burrinjuck. The dam, which has now reached a height of 200 feet, is to be of an ultimate maximum height of 236 feet, and is built of monolithic concrete blocks each constructed of 15 feet of stone, 7 feet of sand and one cask of cement. The dam serves to regulate the flow of water in the Murrumbidgee River, and the water for irrigation is diverted from the river by a weir into the main canal, which is one chain wide and about eight feet deep. The irrigation system is operated entirely by gravitation. Owing to time being short Prof. Luigi Luiggi discussed the paper shortly, and followed with his own paper on Tripoli, describing the conditions to be met with and referring especially to a method of constructing dams in a cheap and expeditious manner. An official luncheon was given to overseas members by the Lord Mayor at the Town Hall, followed by a garden party at Government House.

The sensation of the meeting was provided in the Anthropological Section by the display of the skull of a prehistoric man, believed to date back to about the Pleistocene age, about 25,000 years ago. The skull was found by a boundary rider in the Darling Downs.

Appropriately enough, the evening lecture at the Town Hall, by Prof. G. Elliott Smith, was on "Primitive Man."

A number of members left on Friday night for week-end excursions, a large number going to the Blue Mountains, where a number of excursions had been arranged. The principal excursion which attracted the largest number was that to the Jenolan Caves. These caves, though not of great extent, are noted for the beauty of the formation and colouring, and have been made easily accessible, the principal caves being illuminated by electric light.

Another large party, principally geologists, visited the Maitland District, which is now the principal coal-mining district, and others went to the Murrumbidgee irrigation works and Burrinjuck Dam.

On Saturday evening Prof. Benjamin Moore delivered a public lecture at the Town Hall on "Brown Earth" and "Bright Sunshine." Sir Oliver Lodge delivered an address on Sunday afternoon at the Lyceum.

There was no meeting of the Engineering Section on Monday afternoon, owing to the absence of a number of members on the various excursions, with the result that the Tuesday morning meeting was

very crowded and had to be sub-divided into three sub-sections, one joining with the Mathematical and Physics Section in a discussion opened by Sir Oliver Lodge on "Wireless Telegraphy." In Section G 1 papers were set down to be read by Mr. J. J. C. Bradfield on the proposed Metropolitan Electric Railway for Sydney, by Mr. W. E. Adams on "Australian Ports in Relation to Modern Ships and Shipping," by Dr. W. Rosenhain on "The Distribution of Phosphorus in Steel," by Prof. T. Hudson Beare on "Tests of Petrol Fire Engines" and "Resistance of Canons Hose," and by Prof. W. H. Warren on "Australian Timbers." Section G 2 started with the report of the Committee on Gaseous Explosions, presented and explained by Prof. Dalby; a paper by Prof. Coker and Mr. W. A. Scoble on "Temperature Cycles in Heat Engines" was passed over owing to Prof. Coker having to take the chair in Section G 1. Prof. Thornton then gave an interesting paper on "The Lost Pressure in Gaseous Explosions," the only contributor to the discussion being Prof. Dixon, who gave some results of experiments made in a similar direction and described an ingenious method of photographing the sound-wave immediately behind the explosion-wave. Owing to the absence of Dr. Eccles and Prof. Howe, their papers respectively on "The Balsillie System of Radio-telegraphy" and "The Capacity of Radio-telegraphy Antennae" were omitted, and Prof. Thornton continued with a paper on "The limiting Conditions for the safe use of Electricity in Coal Mining," to the discussion of which Prof. Dixon was again the only contributor. Prof. Thornton, in commencing his paper, alluded to the fact that the New South Wales Government was the first to institute an examination for colliery electricians. Prof. Dixon said that experiments with ordinary coal gas and dust did not give reliable results as regards the effects due to fire damp or methane, as methane is not so easily ignited or so violent in explosion as coal gas, and pointed out that pure methane was difficult to obtain.

A luncheon was tendered to the engineering members by joint Engineering Societies in New South Wales, including the local members of the Institution of Civil Engineers, the Engineering Association of New South Wales, the Electrical Association of New South Wales, the Institute of Architects, the Surveyors' Institute, and the Sydney University Engineering Society. The chair was taken by Mr. T. W. Keels, M.Inst.C.E., and the toast of the Visitors was responded to by Sir Oliver Lodge, Prof. Coker, and Prof. Luiggi.

Sir Ernest Rutherford's lecture on "Atoms and Electrons" on Monday night was given to a crowded house.

The conversazione at the University on Tuesday had to be postponed owing to the death on Monday evening of the Chancellor of the University, Sir Normand Maclaurin.

RELATION OF THE AUTOMOBILE TO THE CENTRAL STATION.

In a paper, by Dr. C. P. Steinmetz, which was reprinted in our American contemporary *The Central Station*, the author deals with the above subject, first of all tracing the historical development of the automobile, which, he suggests, comprises three stages: the period of initial development; then the period of culmination where it has been picked up and made the popular dominant sport of society; and then the period of decay as sport and readjustment in a permanent condition as a business proposition. The automobile has not reached the latter stage of development, and the author turns to the bicycle, showing that it is now recognised as a business convenience and, as such, has found a permanent place in modern life. The automobile has been and still is the popular sport of the exclusive, but in the last years by mass production, cheap and reliable automobiles have come on the market and within the range of people of moderate means; thus its exclusiveness has ceased, and there is now an appreciable falling off in long-distance touring by automobile by the very well-to-do set. This is the beginning of the end of automobiling as a popular sport.

Just as people have realised that it is hard work to drive a bicycle, and not a pleasure to look after it, so they will realise that maintaining and taking care of an automobile and its engine is not a pleasure, and that it is hard work driving a high-powered machine over country roads. When that time comes the automobile will find its sphere—not as an appliance of sport but as a useful commodity, a business and pleasure vehicle.

While there are more bicycles in use to-day than ever, the average riding distance has very greatly decreased, and this will follow in the case of the automobile.

The author then discusses the technical changes which will follow, showing that while the electric car had to drop out of motor propulsion as a sport automobile, because in cross-country riding the two main considerations were high speed and long distance of operation, it did not disappear but found a field of its own as a safe and convenient vehicle for business and pleasure purposes in town. These uses, in the author's opinion, will be permanent uses of the automobile after the sport period has passed. The desire of the town user to use his automobile for sporting purposes on Sundays and holidays, which has led to a preference for the petrol car, will disappear when cross-country touring by car is no longer a popular sport.

Under the changed situation the two characteristics which gave the petrol car dominance—high speed and high mileage—will cease to be of importance, and when the stimulus of the enthusiasm of a popular sport vanishes, the average man will prefer the simplicity and convenience of the electric car to the complications of control and the fixing and tuning up of the petrol car which he now considers as a recreation. The user of a bicycle considers it an inconvenience to have to take care of it, and this means in a vehicle for business that we must have as much reliability as requires no attention, in which case the advantage is with the electric.

The characteristics of the future electric car will necessarily differ from those of the present electric car. The author summarizes future requirements as: Moderate speed—a maximum of, say, 20 miles an hour, and moderate radius, possibly 30 miles, which will be practically sufficient for the day, recharging at night. This means a light battery, a correspondingly light motor and structure; a vehicle weighing, inclusive of battery, probably less than 1,000 lb. It means a fitting up not luxurious, as the present electric, but plain and simple like the low-priced petrol car. It means a price not exceeding $500.

With such an electric in the days of decadent sport of automobiling, the author considers that there will be little chance for the petrol car to compete, and he has no doubt that in ten years, probably less, the field of the pleasure and business vehicle will be covered by such an electric car and that a million or more will be used.

From the central station's point of view, a million vehicles, estimating that they required 10 kw.-hours per charge, would require about 1,500,000,000 kw.-hours a year, equal at the 5-cent. rate to $75,000,000 of business, giving a steady load of from six to eight hours. As this load could be placed in off-peak hours, it would be obtained with practically no extra investment except for charging sets.

In addition to these pleasure and business vehicles (*i.e.*, passenger cars used for pleasure and business) the author points out that there is the electric truck demand; this vehicle is already being successfully exploited, because the limited radius and moderate speed fit it to the nature of the delivery business and its lesser maintenance charge and simple control will make it supreme.

This type of vehicle will require probably another equal amount of power.

The author then considers how this business could be taken up by the central stations, and concludes that it would be undesirable to let the garage take care of automobile charging, because of its inherent preference for the petrol car, the repairs and supplies to which give it a large income, which would not be the case with the electric car. In the matter of charging, too, if the private garage did this work, the central station would again meet the competition of the isolated plant under much more formidable conditions than in the case of the business building, because the staff trained in the care of the petrol engine would be the most suitable for looking after isolated plants. So the author concludes that the central station must in the beginning take hold of this new business, and that the most promising method of doing it would be for the central station to undertake the electrical maintenance of the automobile at a fixed monthly charge of from 5 to 20 dollars, the owner leaving his car at the station garage overnight so that it would be ready for use in the morning.

The author believes that on a 5-cent rate, a charge of $10 a month would cover charging and storage costs, and make the electric cheaper to keep than a horse or a petrol car; the average cost of power he puts at less than 1 cent per kw.-hour, and the additional business valued at $75,000,000 would give $60,000,000 available as additional central station profit.

THE USE OF LIQUID FERRO-MANGANESE IN THE STEEL PROCESSES.

By AXEL SAHLIN (Brussels).

(*Abstract of paper contributed to the* Iron and Steel Institute, *September*, 1914.)

The ordinary method of adding ferro-manganese to a charge of steel results in a loss of manganese of from 35 per cent. to 18 per cent. of the metal added. If the manganese loss could be recovered, this would, for a steel plant producing 300,000 tons of steel yearly, represent a saving of 480 tons of ferro, which, at £11 per ton, is equivalent to £5,280 saved yearly. Whether it pays to make an effort to recover part of this amount depends on the cost of melting 1,920 tons of ferro.

Until the advent of the electric furnace no suitable appliance for dealing with this problem had been available. Now, however, electric ferro-furnaces are installed in a number of steel plants.

In a paper by Mr. Indenkempen it was stated that arc furnaces—the Héroult, Girod, Nathusius and Keller—as well as induction furnaces such as the Roechling-Rodenhauser—had been used for melting ferro. He gives, as an average on which to base calculations, an energy consumption of 900 units per ton of ferro melted and kept hot. Several opponents objected to this figure, and 800 units were generally given as correct for average practice. If we compare this with the ascertained theoretical consumption of 350 units for melting and heating to 1,500° C. 1 ton of ferro, we arrive at an average furnace efficiency of 43·75 per cent. The reasons for the high power consumption in melting ferro may be traced to the following causes:—(1) Intermittence of deliveries; (2) radiation; (3) immersion of the lumps of metal in the bath, where they sink to the bottom of the furnace; (4) in the arc furnaces the proximity of the electrodes to the bath tends to set up a chemical reaction, and results in a certain loss of metal.

In 1913 there was placed on the market a new type of electric arc furnace, the invention of Mr. Ivar Rennerfelt.* The furnace is built as a steel cylinder, with length and diameter practically equal. This cylindrical shell is supported on rollers or trunnions, and is furnished with one close-fitting charging and tapping door. The inside of the shell is covered with a layer of asbestos board, about 1¼ in. thick. Next to this is placed a lining of suitable first quality fire-brick. Against this rests the inner working lining of magnesite brick, fettled with a sintering composition of dolomite. Thus lined, the little furnace forms an egg-shaped melting vessel, withstanding a working temperature of above 2,000° C. Centrally in the roof, and horizontally through gables or sides, enter water-cooled bronze electrode holders, through which slide, with a very neat fit, three Acheson graphite electrodes turned to exact size. The diameter of these electrodes varies from 1½ in. for the smallest up to 4 in. for the largest furnace. Any available three-phase current, preferably of 50 to 60 cycles, is converted in stationary transformers, by Scott's coupling, into two-phase current at 70 volts pressure for the smallest, up to 90 volts for the largest furnace. One phase is coupled to each side electrode. The central vertical electrode is connected with the common point between the two phases of the transformer. When the current is turned on, the arcs, instead of passing directly between the points of the electrodes, are deflected downward, forming an inverted arrow-head or *fleur-de-lys*, with a height of 6 to 12 in. When the bath has been formed in the furnace, the points of the electrodes are adjusted at such a height above the surface of the bath, that the point of the "arrow-head" impinges on the surface of the metal, throwing out waves of heat radiating towards the edges of the bath. When the furnace is to be preheated, the current is simply turned on, there being no necessity for solid fuel or metal in the furnace. The furnace can be charged and tapped with the current on the electrodes. The consumption of electrodes for melting ferro is from 2 to 3 lb. per ton of metal. The electrodes are fed forward by hand-wheel and rack mechanism as they are consumed. They are spliced by screw joints. The whole furnace is remarkable for its simplicity and compactness, and for the small and well-protected surface, in comparison with its cubic capacity, which it exposes to radiation.

The experiments in which I have been interested were made at the instance of the Elektriska Ungar Co., Stockholm, owners of the Rennerfelt patents, and were supervised by Mr. Ivar Rennerfelt.

Test No. 1, *made at Hallstahammar Bolt and Nut Factory, Sweden, June* 11*th*-12*th*, 1914.

Capacity of furnace, 1 ton to 1½ ton; kw., 200; diameter of electrodes, 3 in.; current supplied, two-phase 50 cycles; voltage, varying 65, 80, 95, 110 volts.

The furnace is usually employed for making steel castings and dead soft steel ingots for special purposes. The voltage is usually regulated to 110 volts at the start and 95 volts at the end of the charge.

The number of men employed when making steel is one melter and two boys per shift (five charges per 24 hours; two shifts).

Temperature of furnace, 1,588° C.; 1,000 kg. of ferro, in cold lumps, were charged. Time for melting 1 ton of ferro, 2 hours 45 minutes. Expenditure of units per ton of ferro, 441 units. Average amount of power used, 160 kw.

Other tests of a similar nature followed.

During the first few minutes after charging, small reddish clouds of smoke escaped through the joint at the top of the door. Afterwards there was no sign of manganese smoke.

The consumption of electrodes was ascertained to be about 3 lb. per ton of ferro-manganese.

Assuming the cost of electric current to be 2·5 centimes (½d.) per unit, which is a safe figure for most steelworks, the cost of melting ferro in the Rennerfelt electric furnace, poured off hot into the receiver after melting, would be, per ton:—

	s.	d.
Loss of ferro, assumed, 1 per cent. at £11 ...	2	2
3 lb. of electrodes at 6d.	1	6
Repairs, from experience	1	3
Royalty, average	3	6
Current, 441 units at ¼d.	9	2
Depreciation, 15 per cent.	3	9
Labour, one man per shift	3	8
cost of melting 1 ton ferro ...	25	0

For a steel plant producing 300,000 tons of steel per year:—

Gross cost of ferro saved at £11 per ton... ...	£5,260
Less—cost of melting 1,920 tons of ferro at 25s.	2,400
Net saving per year ...	£2,860

This saving is a minor consideration as compared with the great advantage gained by the uniform distribution of the manganese in the steel, resulting in a higher quality of product.

By the above tests the following points were established:—

1. That the melting of 1 ton of ferro, charged into an empty and pre-heated Rennerfelt furnace, requires less than 450 (441) units. The corresponding efficiency of the furnace is 78 per cent. to 79 per cent.

2. That the melting of 1 ton of ferro, if dropped into an existing liquid bath in the furnace, will require less than 750 (average 741) units, the corresponding efficiency of the furnace being 47 per cent.

3. That the keeping hot of 1 ton of liquid ferro in the electric furnace during one hour at constant temperature requires less than 80 (77) units, or about 30·5 per cent. of the regular power consumed by the furnace when melting.

Similar tests were made at the Ljusne Works of the Ljusne-Woxna Iron Co., Sweden, and fully bore out the foregoing results.

In order to get the best results, the furnace must be used only as a melter of ferro, exposed directly to the heat rays. The metal, as soon as melted, should be removed from the furnace into a ladle or into a receiver.

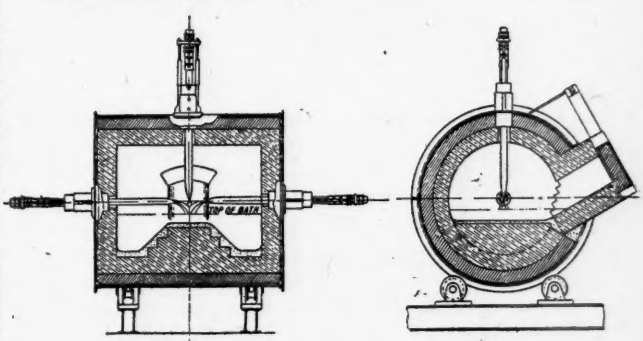


Fig. 1.—Rennerfelt Ferro Furnace with Melting Bridge.

Fig. 1 shows a furnace with, in front of the charging and tapping door, a small bridge or platform of magnesite brick. The top level of this platform should be slightly below the level of the liquid bath when the furnace is charged. The cold ferro should be placed on this bridge, in close proximity to the heat arcs, the lumps of ferro being exposed to them. To the users of the Rennerfelt furnace this offers a simple and inexpensive expedient, which is bound to maintain the economy indicated by the first melting. It is suitable for works in which the ferro is required frequently, regularly, and in small quantities.

The following sizes of furnace are recommended for plants running regularly subject to revision in case of special requirments:—

For steelworks producing up to—	Furnace capacity.
75,000 tons per year	6 cwt. (300 kg.)
200,000 ,, ...	12 cwt. (600 kg.)
400,000 ,, ...	25 cwt. (1,250 kg.)

* The Rennerfelt furnace was fully described in the Electrical Review of July 17th, 1914.

Freemasonry.—The consecration of the Kelvin Lodge will take place at Mark Masons' Hall, Great Queen Street, at 5 p.m. on Friday, October 23rd. Members of the electrical profession who are members of the craft are cordially invited to be present at the ceremony. Brethren wishing for information concerning the Lodge are requested to communicate with the Secretary, Mr. Osborne Pearston, 4, Ludgate Hill, E.C.

THE STRENGTH OF FLAT PLATES.

A REPORT of the chief engineer of the Manchester Steam Users' Association deals with a number of experiments on flat plates, the strength of which has long been a matter of uncertainty. No flat surface is theoretically capable of withstanding steam pressure, for no resistance can be developed unless the plate becomes bent to a greater or less degree. Actually, therefore, in practice a flat plate becomes a modified catenary in section supported on piers or abutments. It forms to some extent a girder more or less fixed at each end. Unlike a girder, it is supported all round, and when it yields it becomes a dish. But usually a flat surface is much too large to be supported only round its edges, and in most boiler work flat plates are double, with a narrow space between them, and they are held together by stays screwed into both plates and riveted or nutted at the ends. Thus the surface resolves itself into a series of rectangles each supported by a stay at its central point, such stay to be sufficient to carry the steam load upon the plate area. But the many rectangles are joined to each other at their edges, and this adds some resistance, and when a stay fails the plate still resists by virtue of such all-round continuity with its fellows. In boiler practice it is quite usual for many stays thus to fail without the homogeneous continuity of the boiler being destroyed. But it is clear that no amount of mathematical knowledge will permit any close approximation to the strength of such constructions to be attained.

The memorandum deplores the poverty of the Board of Trade investigations of boiler explosions under the 1882 Act, and of their reports, from which it is usual to omit such information as is of any real technical value.

In Germany investigations are better carried out, and manufacturers will often assist by carrying out required tests of elucidation. The memorandum surveys one hundred of the Board's reports on failures of flat stayed plates, and says that without outside help the survey would have been valueless, for the Board's reports are of little use owing to the serious omissions named above.

The strength of flat surfaces received little experimental attention until the *Thunderer* explosion. On the question of applying a factor of safety (of five) to the experimental bursting stress, it is remarked that a bulged plate is a different structure from a flat plate, and it is obviously unfair to say that because a stay-bolt tore on a test pressure of 500 lb., the flat plate, which did not tear, must not be loaded above 100 lb. intensity if a larger stay were fitted.

Clearly there should be a reasonable approximation of strength between stay and plate. The old rule for plates generally was that one-half the hydraulic pressure producing no permanent set might safely be allowed.

The preliminary study of all available flat plate tests showed that strength depended not merely on plate thickness, but on the stay diameters and on the size of the nuts or washers of bolted stays.

There are stresses in stayed plates other than those of bending. The radii of curvature of similarly strained beams are inversely proportional to the squares of the spans, and the slopes are proportional to the cubes of the spans. The slopes of stayed plates are localised about the stay holes, and it is shown that permanent deformations occur near the stays with a stress only about an eighth of the bending stresses. The severe stresses in the material around the holes lead to cracks, and there is little room to doubt the wisdom of giving support to a plate at the stay by means of good nuts and stout washers. In no case, however, are the stresses, which are termed vortical, which are exerted in rings about the stay holes, to be considered as negligible. A curious confirmation of these already formed conclusions was soon to be given, for a locomotive firebox was found in which the plate between the stays had wasted to $\frac{1}{16}$ in., and even to $\frac{1}{32}$ in., yet this plate withstood 70 lb. per sq. in. pressure on an area $5\frac{1}{4}$ in. × $4\frac{1}{2}$ in. There was no bulging reported.

The report is interesting more particularly to locomotive engineers. In stationary work the flat stayed surface is apparently hardly used, except in Lancashire boilers, and these are daily being more made with dished ends of a curvature sufficient to avoid the use of stays of any sort.

War Lighting.—In a previous issue we referred to the reduction of street illumination which has recently been carried out in London and provincial cities, by order of the military authorities.

Apparently some people do not comprehend the finality of a military order; at any rate the Chief Commissioner of Metropolitan Police has issued a further more stringent order for enforcing the requirements in those situations where too much lighting is being employed. We notice that a Chiswick innkeeper was recently fined £5 and costs for disregarding police instructions in this matter. Apparently our contemporary, the *Gas World*, blames the electricity people (as a matter of course), for it says: "Information has reached us to the effect that some of the worst offenders against the first ordinance were some municipal electricity supply undertakings who persisted in keeping up their arc lighting. . . ." Probably it overlooked the recent announcement of the *Daily News*, that "Yesterday (October 7th) the authorities extinguished 13,000 high-power gas lights in South London." The latter paper also states that a conference of all the London electric lighting concerns has been held, and that unless the citizens respond to the proclamation, the lights will be arbitrarily lowered in a more sweeping fashion than ever.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

20,254. "Attachment of electrical conduit tubes to junction pieces." T. A. SMITH & W. H. OWEN. September 28th.

20,272. "Clutches for use more particularly in driving mechanism of lighting dynamos for automobiles or the like. SOC. ANON. ETABLISSEMENTS L. BLERIOT. September 28th. (Convention date, October 2nd, 1913, France.) (Complete.)

20,274. "Telegraphy." W. JUDD, A. FRASER, K. L. WOOD, & EASTERN TELEGRAPH CO., LTD. September 28th.

20,279. "Portable electric apparatus for medical or like purposes." H. HERGENS. September 28th. (Convention date, September 29th, 1913, Germany.) (Complete.)

20,286. "Electrical heating-unit and method of manufacturing the same." F. W. BALL. September 28th. (Complete.)

20,293. "Reciprocating armatures." I. H. PARSONS. September 29th.

20,303. "Electric glow-lamps." A. G. SMART. September 29th.

20,304. "Method or process of producing or manufacturing pure or nearly pure metallic tungsten powder. W. B. BALLANTINE. September 29th.

20,308. "Apparatus for transforming electric currents." ESTER & CO., LTD., and A. P. STROHMENGER. September 29th. (Complete.)

20,312. "Dynamo-electrical machines." BRITISH THOMSON-HOUSTON CO., LTD. September 29th. (General Electric Co., United States.)

20,319. "Line or wireless telegraph systems." W. H. SHEPHARD & A. E. MCKECHNIE. September 29th.

20,322. "Control of electric motors." IGRANIC ELECTRIC CO., LTD. September 29th. (Cutler-Hammer Manufacturing Co., United States.) (Complete.)

20,330. "Electrical ignition apparatus for internal-combustion engines." M. S. CONNER. September 30th.

20,331. "Dynamo-electric machines for supplying current for lighting and general purposes as well as for the ignition devices of internal-combustion engines." G. H. WOODS. September 30th.

20,342. "System of and means for signalling electrically." H. GREEN and W. DE M. LANDON. September 30th. (Complete.))

20,356. "Glassware for artificial lighting." W. T. DEAN. September 30th.

20,374. "Electric discharging-tubes." B. DONATH. September 30th. (Convention date, October 10th, 1913, Germany.) (Complete.)

20,409. "Insulating material for electrical purposes." H. GROSSMAN. October 1st. (Complete.)

20,436. "Railway electric signals." E. O. EVANS and J. P. SAUNDERS & Co., LTD. October 2nd. (Addition to 20,318/13.)

20,452. "Impulse responding devices." BETULANDER AUTOMATIC TELEPHONE CO., LTD., & D. C. CREWE. October 2nd.

20,453. "Telephone exchange systems." BETULANDER AUTOMATIC TELEPHONE CO., LTD., & W. AITKEN. October 2nd.

20,458. "Prepayment electricity meters." LANDIS & GYR, LTD. October 2nd. (Convention date, October 1st, 1913, Switzerland.) (Complete.)

20,459. "Construction of projectile." S. O. COWPER-COLES. October 2nd.

20,460. "Arc lamps." J. L. DINSMOOR. October 2nd.

20,478. "Means for carrying, conveying, and storing electric lamp bulbs." S. WHALLEY. October 3rd.

20,505. "Installations comprising electro-magnetic machines and in which the tension or intensity of these machines is subject to variations." SOC. ANON. DES ETABLISSEMENTS L. BLERIOT. October 3rd. (Convention date, October 13th, 1913, Belgium.) (Complete.)

PUBLISHED SPECIFICATIONS.

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19,854. GALVANIC BATTERIES. J. E. Preston. September 2nd.

20,444. LAMPS FOR CYCLES, MOTOR VEHICLES, AIRCRAFT, AND OTHER SERVICE. C Y. Hopkins. September 10th.

20,725. HOLDERS FOR INCANDESCENT ELECTRIC LAMPS. E. Dobson. September 13th.

20,990. ELECTRIC TORCH. J. Aikman, Jun. September 17th.

21,607. AUTOMATICALLY ADJUSTABLE IGNITION FOR INTERNAL-COMBUSTION ENGINES. S A. Horstmann. September 25th.

22,926. ELECTRICAL CONNECTION OF THE PLUG AND SOCKET TYPE. E. H. Leonardt. October 10th.

26,657. SHADE-HOLDER FOR INCANDESCENT ELECTRIC LAMPS. T. McClelland, Jun. November 20th.

28,059. ELECTRIC AND VIBRATORY HORNS OR ALARMS AND METHODS OF OPERATING SAME. E. V. Gratze. December 5th.

1914.

441. MERCURY BREAKS OR INTERRUPTERS. H. F. Bigge and F. R. Butt. January 7th.

6,777. FIRE ALARMS. G. H. Oatway and T. Watson. March 17th.

9,611. TRACK CIRCUITS FOR RAILWAYS. W. H. Dammond. April 18th.

11,343. MEANS FOR SUPPORTING AND INSULATING CONDUCTOR-RAILS OF ELECTRIC RAILWAYS. E. P. B. Estler. May 8th.